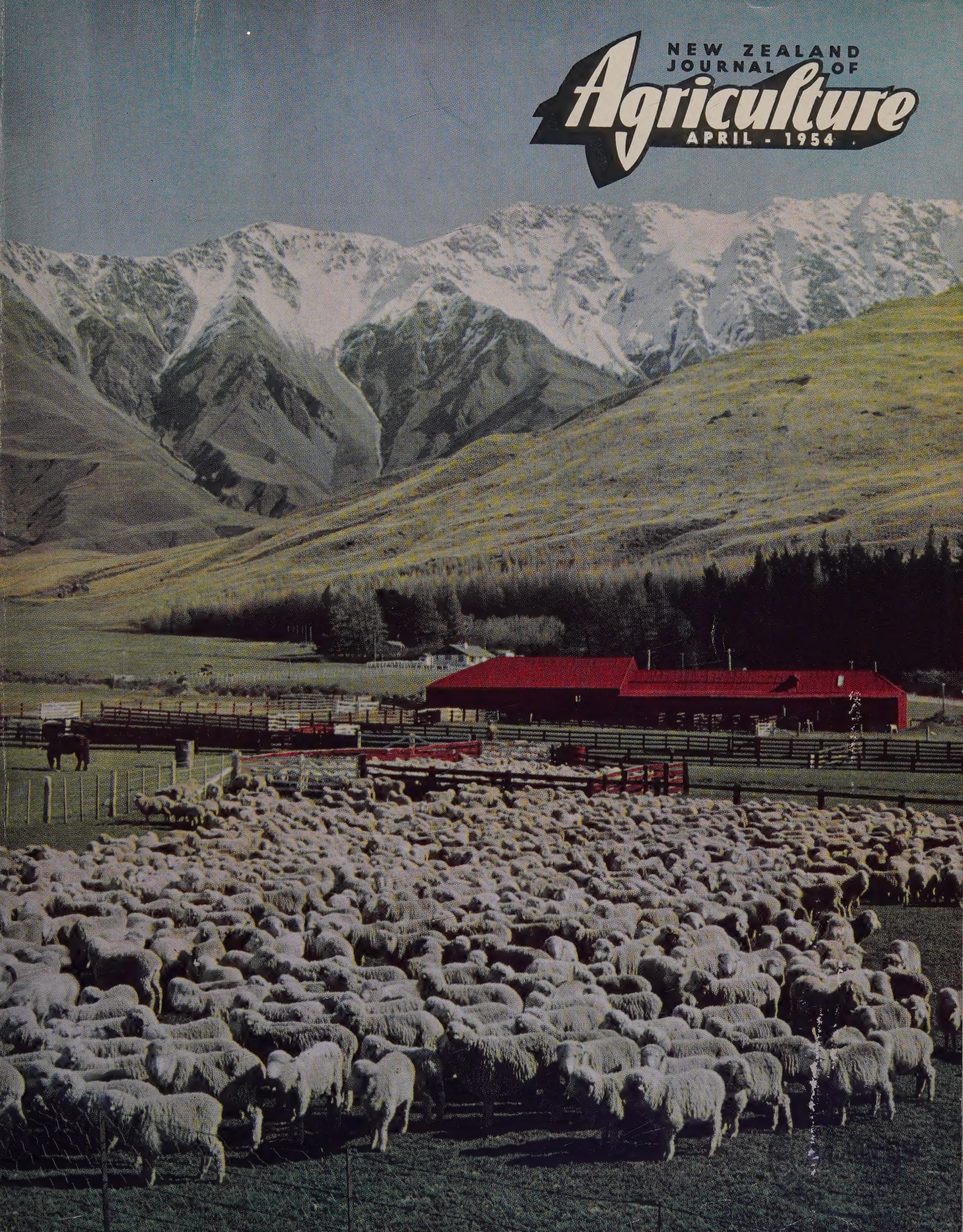
NEW ZEALAND JOURNAL OF Agriculture

APRIL - 1954



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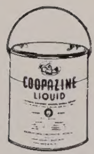

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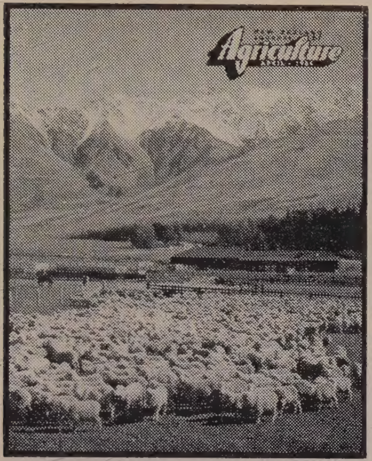
This Month's Cover



Part of Glentanner Station, between Lake Pukaki and the Hermitage, Mt. Cook, is shown on this month's cover. The scene was reproduced from a colour photograph by National Publicity Studios. The station is one of the large holdings in Mackenzie County, a good deal of which is high country with tussock cover. Here Merino sheep often predominate and almost the sole product is fine wool. The Mackenzie district was occupied in the early days of the development of Canterbury Province, Glentanner Station being taken up in 1858.

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HEADING PHOTOGRAPH: Rotationally grazed yearlings in winter. These are typical of stock reared under this system.

Good Rearing of Dairy Stock

By C. P. McMEEKAN, Superintendent, Department of Agriculture Animal Research Station, Ruakura

THE New Zealand dairy industry has reached the stage where nearly 2,000,000 cows are milked. These cows have an average working life of 5 years, so that each year nearly 400,000 head of young dairy stock are reared as replacements, representing at first calving a capital value of over £10,000,000. This article, the first of a series of three, is designed to provide dairymen with the latest information on the rearing of these key animals. The introductory section, a summary of which appears below, emphasises the importance of good rearing, discusses the peculiarities of New Zealand rearing methods, and outlines the investigations which have been made under New Zealand conditions. Specific recommendations are given on the rearing of calves from birth to weaning. Two subsequent articles, which will appear in the May and June issues of the "Journal", will deal with the rearing of dairy stock from weaning to mating and from mating to calving. At the beginning of each article a summary is given setting out the salient points.

"A COW is made or marred as a calf". This axiom has been the traditional view of British dairymen through the ages. In one form or another it is found in every text-book on dairy farming. Like many other such beliefs it is not strictly true. It is not always true, because all animals—and dairy cattle are no exception—are capable of withstanding considerable adversity while young without harmful permanent effects. At the same time there is sufficient truth in the belief to justify good care and attention to dairy stock during their growing years.

In the first place it will be obvious that feeding and management of the young dairy animal can be so poor that, in contrast to a mere check to normal growth, death can occur. It is equally obvious that this end-result is quite a commonplace on many thousands of dairy farms in New Zealand. Each year the records show an average mortality rate among dairy calves of approximately 6 per cent. from a week to 12 months of age. A further 3 per cent. die during their second year. On individual farms total deaths may rise as high as 50 per cent. A large proportion of these losses can be attributed to inefficient rearing.

In the second place large, well-grown dairy heifers do out-produce poorly grown ones during their first 2 years of productive life, though, because of their amazing adaptability and recuperative powers, the poorly grown ones tend to produce equally well by the time they are mature. The kindly climate and ample pasture growth of New Zealand permit this recovery under a wide range of pasture management methods.

The production advantages of good rearing from birth to 2 years of age have been measured in carefully controlled experiments during the last 10 years at the Ruakura Animal Research Station. Heifers calving down for the first time at 2 years of age and weighing from 700lb. to 740lb. liveweight at calving have produced an average of 30lb. more butterfat than comparable cattle which have been so poorly grown that they calve at from 600lb. to 650lb. liveweight. Production in the second season has averaged 20lb. of butterfat in favour of the well-reared cattle. Thus, "good" rearing compared with "poor", as represented by such calving weights, has been worth 50lb. of butterfat for every dairy heifer reared.

If all the heifers reared annually in New Zealand were no better grown than those designated in these experiments as "poorly reared", the reduced production would cost the industry £3,000,000 annually at current prices.

Summary

1. Rearing methods are of prime importance to all dairymen as a means of reducing mortality in potentially valuable stock to a minimum.
2. Large, well-reared heifers will outproduce small, poorly reared stock of similar dairy quality during their first 2 years of milking life.
3. Methods of rearing young stock developed in other countries are of little value under New Zealand conditions.
4. Recent research has systematised radically different methods suited to New Zealand. Straightforward recommendations can now be made with confidence.

It is true that no reliable records exist to show just how many annual replacement heifers are poorly reared. Sufficient is known, however, to suggest that the figure is a substantial one.

It may be concluded therefore that though dairy stock can largely recover from the effects of early under-nutrition, these two factors—mortality and under-production for 2 years—justify the serious attention of all dairymen to methods which will secure adequate growth in young stock.

These views on the importance of rearing may be criticised on the grounds that they are too limited and make no reference to the effect of rearing on resistance to disease. Most dairymen are concerned at their annual herd wastage figures. Many believe that good rearing methods are important in building healthier cattle. Though a reasonable case can be made for this argument on theoretical grounds, there is as yet no reliable evidence, either from field surveys or from direct experiments, that losses in mature cattle can be attributed to poor rearing. Absence of such data is, of course, no excuse for taking unnecessary risks, especially since the other measurable benefits are so great.

Peculiarities of N.Z. Rearing Methods

In many branches of farming New Zealand has had to develop methods specially adapted to her particular natural and economic conditions. These methods often differ radically from those accepted in Britain, Europe, and North America as basic to good farming. A good example is the New Zealand system of feeding dairy cows, which is unique, because milk is produced almost exclusively from grassland. In contrast the systems typical of other major dairying countries depend very greatly on arable crops and concentrate fodders.

New Zealand methods of rearing dairy stock are a further example involving striking differences from systems accepted as standard in overseas countries. Three interrelated features distinguish New Zealand methods.

In most other countries calves are born throughout the year, so that problems of feeding vary according to the seasonal conditions operating. In consequence a calf has to be handled as an individual and special precautions have to be taken to protect it from the rigours of unseasonable weather and the wide variations in the supply of pasture nutrition. In contrast New Zealand dairy calves tend to be born at one time of the year. Of similar ages, they can be handled in groups. Feeding and management at any one time are thus much easier. Since the time of birth coincides with spring and the onset of improving weather, the elaborate housing which is unavoidable in most other lands during the first 6 months of life is unnecessary.

The second major peculiarity is the dominant place of pasture in the nutrition of New Zealand calves. New Zealand pastures, particularly during the first few months of the lives of calves, are of such a high nutritive quality that cattle can derive substantial benefit from them at an early age and over almost the whole of their pre-weaning period. Supply tends to increase as the calves grow older, so that under good management pasture alone can soon provide a completely adequate diet and does so from weaning onward in the vast majority of cases.

Calves in Europe and America seldom are given access to pasture during their first 6 months of life. Some overseas experts have even gone so far as to recommend that no calf should be given pasture for the first 6 months. Calves are kept inside during this time and reared on special foods. Even after weaning such foods continue to be necessary to permit adequate growth under the poorer pasture conditions normally prevailing.

From this ability of New Zealand pastures to supply such a substantial part of the feed requirements of growing dairy cattle springs the third distinguishing feature of New Zealand methods. Obviously, cereal concentrates are not essential under New Zealand conditions, whereas their use is unavoidable in other lands. Still further, the organisation of the New Zealand dairy industry predominantly on a basis of butter manufacture leaves large supplies of separated milk available for calf rearing. In consequence milk-replacing supplements are of no importance on the butterfat supply farm in New Zealand, whereas they are a major factor in countries where most of the milk of dairy cattle is sold for direct human consumption. As will be seen later, such milk-replacing supplements are not really necessary in New Zealand even on whole-milk-selling farms provided adequate use is made of pasture.

These three peculiarities together result in such a completely different approach to calf rearing that a large proportion of the published information on the subject derived from the experiments and experience of scientists and dairymen in the Northern Hemisphere has no application in New Zealand. It should be unnecessary to point out this fact to any thinking dairy farmer aware of local conditions and conscious of the facts discussed in the foregoing paragraphs. Yet a survey of calf rearing methods carried out during recent years by the New Zealand Dairy Board Herd Recording Department revealed that over 70 per cent. of a large and comprehensive sample of farmers throughout New Zealand were feeding grain meals and other supplements in the rearing of their calves. Strangely enough, the percentage was lowest in the South Island (about 50 per cent.), where pasture conditions on the average are probably not as favourable as in the North, and highest (approximately 90 per cent.) in the oldest North Island dairying district—Taranaki. The high percentage of Taranaki farms which have only cheese whey as a by-product for feeding calves may be responsible for this unnecessary dependence on meals.

Fig. 1 (below)—Twin heifer calves are not likely to be sterile and will grow as well as singles.

It seems evident that a large proportion of New Zealand dairymen are not aware of the great advantages of pasture in the rearing of young dairy cattle and in consequence have carried over methods that owe their origin to problems and difficulties encountered in other countries under vastly different conditions. Throughout this series of articles, the main justification for which lies in the obvious need to simplify and improve rearing methods, the outstanding virtues of high-quality, well-managed pastures will be the dominant note.

New Zealand Research

Since much of the accumulated knowledge available from overseas sources on calf feeding is obviously of so little direct value in New Zealand, and since the general experience of farmers over the years has indicated that very different techniques work extremely well, research workers at various centres have considered it worth while to investigate many phases of the rearing problem under New Zealand conditions. Thus Professor I. Campbell and his associates at Massey Agricultural College have interested themselves especially in the problem of concentrate supplements to dairy calves being reared mainly on separated milk and pasture.

A much greater coverage has been aimed at by J. C. Percival, of the Ruakura Animal Research Station. During the last 10 years he has covered systematically a wide range of questions involved in the pre-weaning feeding period. Thus he has investigated such issues as the quality, rate, and time of whole-milk feeding, the quantity, frequency, and duration of separated milk feeding, the time of weaning, and many other related factors.

Other Ruakura workers have been specially interested in grazing management studies with particular reference to growth and development of calves from weaning onward. The grazing behaviour of calves has been studied under different conditions and their ability to digest and utilise pastures has been measured. Still others have been concerned with the use of modern treatments of calf diseases. This series of articles embodies the practical results of all these researches, which are still going on. Sufficient progress has been made to warrant definite recommendations on a large number of issues. Carefully checked results at each centre plus extensive experience under practical conditions indicate quite definitely that farmers adopting these recommendations should have no practical difficulty in rearing well-grown dairy animals.

REARING FROM BIRTH TO WEANING

The growing period in the life of a dairy heifer can be conveniently divided into three main stages: Birth to weaning, weaning to mating, and mating to calving. Growth certainly continues after this until the animal is mature at 4 to 5 years of age, but for all practical purposes the rearing problems of young stock are adequately covered by considering the three stages mentioned.

Of these the first—the period from birth to weaning—is by far the most critical, for it is during this time that the animal is in its most responsive condition, with the result that the effects of both good and bad treatment are most noticeable. The younger the animal the more profound and lasting are any effects of under-nutrition. It is during this period that permanent stunting due to bad feeding can occur. Mistakes made at a later stage can be overcome by the natural ability of the older animal to recover. Made before weaning, however, they may result in such drastic changes in the normal growth behaviour that the final animal is radically different in size, conformation, and body composition from what it could otherwise have been.

Recommendations for Rearing from Birth to Weaning

1. During the first 6 months the growth target for the Jersey calf should be 120lb. at 8 weeks, 220lb. at 18 weeks, and 300lb. at 26 weeks. These weights correspond to chest girth measurements of 33½in., 40in., and 44½in.
2. After allowance is made for breeding factors essential to herd improvement calves selected for rearing should be born before the end of August, have a minimum birth weight of 45lb., and be free from serious deformities and defects such as undershot jaws.
3. Calves must be fed colostrum for at least 2 days after birth; this is most easily accomplished by allowing natural suckling for this time.
4. Rationed feeding on whole- and separated milk, strict rotational grazing management, and weaning at 16 to 18 weeks are the easiest way of reaching the growth target set.
5. Early weaning (8 weeks or 120lb.) is recommended on any farms where saving of labour is important and for cheese, dried milk, and whole-milk supply farms which do not have supplies of separated milk. Early weaning on whole-milk can be efficient and economic. Milk substitutes and concentrate meals are unnecessary.
6. Efficient hand feeding facilities are essential to easy handling and successful disease control. A unit designed as an integral part of the dairy shed and permitting individual feeding meets all requirements.
7. Whatever the feeding routine, trouble-free calf rearing insists on the elimination of the "calf paddock" and the adoption of rotational grazing at from 2 to 4 weeks of age. For best results calves must be shifted frequently round the milking pastures ahead of the herd. Early weaning cannot be recommended unless this is done.
8. Calf scours, pneumonia, and redwater are the major causes of loss and ill health during the pre-weaning period. Sound feeding and management plus adequate veterinary aid can reduce losses to an insignificant level.

It is during this time, too, that disease takes its greatest toll. The newborn calf is born into a world to which it must become rapidly adjusted if it is to survive. Natural resistance to various diseases has to be built up as rapidly as possible and a strong, vigorous body developed which will enable it to withstand the many causes of ill health to which it will be exposed.

Accordingly husbandry must be most efficient during the first few weeks of life and must remain at a high level during the whole of the hand rearing period.

The Target

Experienced dairymen have a very good idea of whether or not their calves are making adequate growth gains and are able to determine this by eye judgment alone. However, there are many more who, through inexperience or lack of opportunity to compare their own stock with those of other farmers, are unable to make such an accurate assessment.

As a practical guide to the kind of growth which high-grade Jersey calves should make and as a target at which to aim the following table sets out the liveweights of calves that are making good growth from birth to 6 months of age.

TABLE I—GROWTH OF JERSEY CALVES FROM BIRTH TO 6 MONTHS

Age weeks	Live-weight lb.	Chest girth in.	
Birth	56	26	
2	70	28	
4	86	30	
6	102	32	
8	119	33½	Early weaning
10	136	35	
12	157	36	
14	178	37½	
16	200	39	
18	220	40	Normal weaning
20	242	41½	
22	262	43	
24	280	43½	
26	300	44½	

These figures are based on data from Ruakura, where over the past 10 years the weekly weights of nearly 2000 calves have been recorded. Farmers with scales can use this table to check periodically the efficiency of their calf rearing methods. Since the majority, however, are not so equipped, the third column of the table sets out the chest girth in inches at each age. Though not as accurate as the weight figures, these measurements are closely related to liveweight and are a very good index of growth.

It is a relatively simple matter for any farmer to use a tape measure to make the periodic check-up suggested. This measurement is taken by running the tape round the body immediately behind the front legs and following the depression behind the shoulder blades to obtain the minimum chest girth. A firm tension must be applied to the tape.

Fig. 2 shows the growth curve of calves during this period. This type of graph will be familiar to every farmer whose wife has reared her children under the Plunket system. The heavy middle line represents the weights of Table 1 and what might be called "good economic growth". This is the target which every farmer should hit. The shaded portion above this to the top curve represents "very good growth"—a target which a careful farmer can hit if he wants to; the shaded portion below the middle curve to the lowest curve represents "poor growth", within which a certain amount of trouble will definitely be experienced and below which it is certainly unsafe to fall.

In other words, calves whose weights fall on or above the middle line will be thrifty and trouble free; calves falling below the middle line are not being given the opportunity to grow as well as they are really able. They will be less thrifty and many may die at a later stage.

These weights and measurements apply to Jersey cattle. Though equivalent growth studies have not been carried out on such a scale with other breeds, available data suggest that the weights should be scaled up by 25 per cent. for Ayrshire and Milking Shorthorn calves and 40 per cent. for Friesian calves. By adding these amounts to the weights of Table 1 breeders of these cattle can obtain an approximate guide to the growth-rate which should be reached. The appropriate chest girths can be read off from the figure corresponding to the new weight, so that the tape measure method of checking up on growth can also be used with these breeds.

Though weights or measurements can be used in this manner to provide a good general guide to the well-being of young stock, the importance of eye judgment must not be overlooked. Signs of ill thrift in calves can be detected by an experienced stockman often weeks before any major slowing down in growth-rate is apparent. Preliminary diagnosis of developing trouble can be a very big help in avoiding disaster. Once calves have become so unthrifty that they have failed to make any gains over a 2-week period it is much more difficult to bring them back to a reasonable rate of gain than it is when signs of ill thrift are detected before such serious damage has been done. The best guide to this is the coat of the calf. A healthy, thrifty animal has a glossy, well-kept coat. A dry, rough coat that does not lie sleekly over the animal's body is a good indication of imminent trouble.

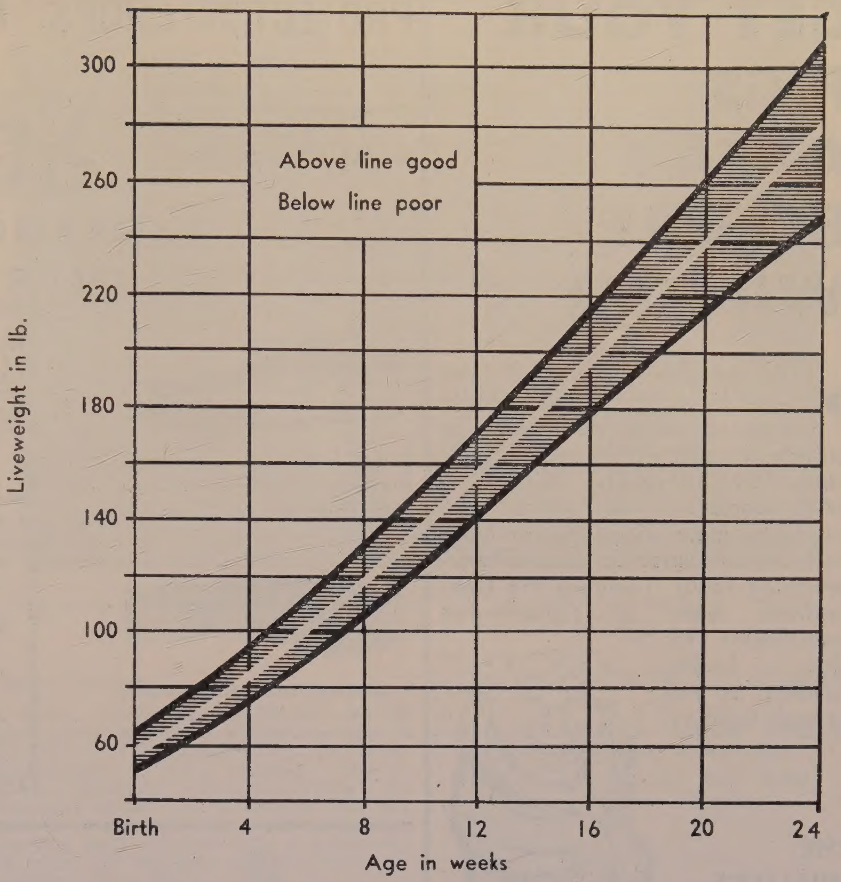

Fig. 2—Growth curve from birth to 6 months. The middle curve and above it should be aimed at. Trouble should be watched for when calves' weights fall in the shaded portion below the middle curve.

Selection of Calves

Selection of calves for rearing must take into account more considerations than those normally discussed under this heading. Selection usually refers to recommendations about the type of calf which should be kept to improve a dairy herd. This involves many complicated aspects of dairy cattle breeding which cannot be discussed in this series of articles. It is assumed that full use will be made of available knowledge of cattle breeding regarding the importance of sire and dam, of records of production of parents and relatives, and of other breeding factors which will assist in selecting calves likely to possess the necessary inherited qualities for high production. It is little use rearing replacement stock unless there is a reasonable chance that the animals will at least maintain the existing standard of production of the herd.

Time of birth is perhaps the most important practical factor apart from these breeding questions. Most farmers have found that calves born early in the season are easier to rear, particularly after weaning, than those born later. As a generalisation this is true, since late-born calves tend to be weaned in a period of the year when the quality and quantity of pasture feed available are falling. It is important to know more precisely, however, just what is meant by "late".

At Ruakura the growth data from several hundred calves have been analysed to help answer this question. The results are important in showing that quite a wide spread in date of birth within a group of calves can be allowed without any material disadvantages. On the average, calves born from June to September have shown no real differences in their rate of growth from birth to weaning. After weaning, however, calves born before the end of July show a better growth-rate for the next 6 months than calves born in August. This difference is minimised by good post-weaning management and can disappear by the time the animals are a year old. Calves from high-producing cows, therefore, may be safely kept up until the end of August, provided the general recommendations regarding feeding and management made in this series of articles are followed.

In addition to the usual breeding factors care must be taken to ensure that no calf is kept that is suffering from any abnormality. One of the most important defects is an undershot jaw. New Zealand cattle have to forage for their feed. An animal which otherwise might be high producing can be prevented by a defective mouth from ever attaining a reasonable output of milk. Unfortunately, weak and undershot lower jaws are difficult to detect at birth, but careful examination a few weeks afterward will usually permit very bad cases to be eliminated. Calves with any obvious deformity should not be kept, since many such defects tend to be inherited.

The weight of a calf at birth is important and farmers are advised against keeping lightweight animals. As with month of birth, however, a fairly wide latitude is permissible. Calves from heifers, which are usually 10 to 20 per cent. lighter than calves from mature cows, and twin calves which may be 30 to 40 per cent. lighter at birth than singles, are capable of making rapid gains when adequately fed. By the time they are a year old they are usually indistinguishable from calves much heavier at birth. As a practical guide a birth weight of 45lb.

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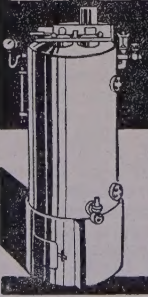

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is a limit below which it is not good policy to fall when selecting calves for rearing.

Reference must be made to the danger of keeping any heifer calf born twin to a bull. The great majority of such heifers are sterile because of abnormalities of their sex organs. During their development within their mother the secretions from the sex glands of the bull calf may be passed into the body of the heifer through a common blood supply. These secretions suppress the development of the sex organs of the female twin. When this occurs the resulting heifer is known as a "free-martin" and will never breed. Twin heifers suffer no such disadvantages and may be kept with safety.

Suckling

It has long been established, both from practical experience and carefully conducted experiments, that colostrum—the milk of the freshly calved cow—is essential to the survival of the new-born calf. Such milk contains antibodies or protective substances by which the mother confers on her offspring her own immunity to diseases likely to be fatal to the very young. In addition colostrum milk is specially designed by Nature to cover the drastic change which occurs in the nutrition of the calf at birth. Before birth the calf is fed through the bloodstream of its mother. Its own digestive organs are unused. Colostrum is specially suited to starting off the change-over to an independent life where the calf has for the first time to use its own digestive system.

A minimum of 2 days' feeding on colostrum milk is essential. There are many debatable issues involved in the question of how best this need can be filled. Since colostrum is useless for any other purpose, one practical method is to leave the calf with the cow for the first 2 days and allow it to suckle naturally. For the benefit of the cow it is desirable to milk out all quarters each day during this time, since a calf is incapable of taking all the milk present and tends to concentrate on one or two teats. This is the standard method employed at Ruakura with the 300 to 400 cows calved down each year.

Farmers who find it more convenient to remove the calf at birth may do so with safety, provided colostrum is fed for the first 2 days. In such cases it is not necessary for the calf to receive its own mother's milk. That from any freshly calved cow will do.

It is extremely difficult to rear a calf that has never had any colostrum. Special precautions have to be taken and colostrum substitutes used. Such substitutes have no practical value in New Zealand, since ample milk of this type is available to meet all needs, and therefore they are not described here. Because it is illegal to separate milk for butter factory supply within 4 days of calving or to sell milk for human consumption within 7 days, there should be a large surplus of such milk on every farm. This need not be wasted, but should be used during the hand feeding period. While still obviously in the colostrum stage (up to 4 days) it should be diluted with an equal volume of water and fed as whole-milk to older calves. After this it can be treated as normal whole-milk.

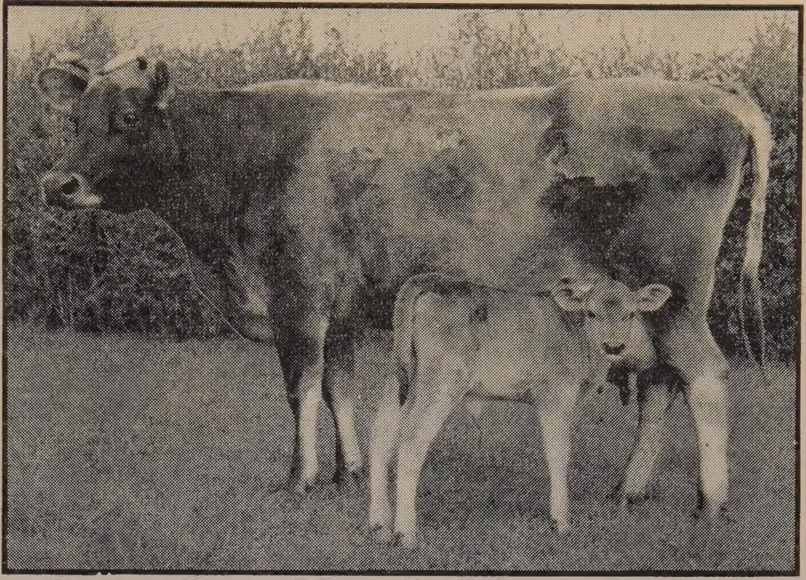

Fig. 3—The new-born calf should be left with its mother for 48 hours. Natural suckling is a practical way of providing colostrum.

Hand Feeding

After the 2-day suckling period recommended calves should be starved for 12 to 24 hours before the commencement of hand feeding. This is a very practical recommendation. No harmful effects are produced, but the calf is encouraged to take to bucket feeding very readily with a minimum of effort on the part of the farmer in teaching it to drink.

Four different hand feeding systems are described below. These are recommended according to the particular system of dairy farming practised, the methods of production, and the labour supply of the farmer. The particular conditions to which each is most applicable are described so that farmers can select the method most appropriate to their particular circumstances.

1. Standard Feeding System

The standard feeding system is an adaptation of methods which have been used and generally recommended in New Zealand for many years. Its special features are:—

1. Whole-milk feeding for the first 3 weeks.
2. Gradual replacement of whole-milk by separated milk during the next 3 weeks.
3. Separated milk for the next 10 to 12 weeks.
4. Gradual increase in the quantity fed from birth to the fourteenth week; gradual reduction thereafter until weaning at 16 to 18 weeks.

The feeding schedule of this system is set out in Table 2, which shows the amount of milk in pints per feed which should be fed twice daily. The ration is set out in weekly periods and a maximum of 16 pints or 2 gallons per day is reached by the eleventh week. This amount should not be exceeded. The total amount of whole-milk required per calf is 31 gallons with 138 gallons of separated milk.

TABLE 2—STANDARD FEEDING SYSTEM (LATE WEANING 18 WEEKS)

Feed in pints per feed (twice daily)

Age weeks	Whole-milk	Skimmed milk
1	3	
2	3½	
3	4	
4	3	1½
5	2½	2½
6	1½	4
7		6
8		6½
9		7
10		7½
11-14		8 (1 gallon)
15-16		4
17-18		2
19		Weaned
Total gallons	31	138

This system has been used at Ruakura to rear well over 1000 calves whose growth performances have been carefully recorded. When the system has been combined with the rotational grazing system later described the result has been the "good" growth curve represented by the middle line of Fig. 2. Under good rotational grazing methods weaning can occur at 16 weeks. It is a system that can be thoroughly recommended to farmers seeking a sound, relatively trouble-free method during the hand feeding period. It is especially recommended under the following conditions:—

1. On butter factory supply farms where ample separated milk supplies exist.
2. Where there is an adequate labour supply so that an 18-week hand feeding period imposes no serious burden.
3. Where pasture management conditions are such that the adoption of an earlier weaning system is likely to be dangerous.

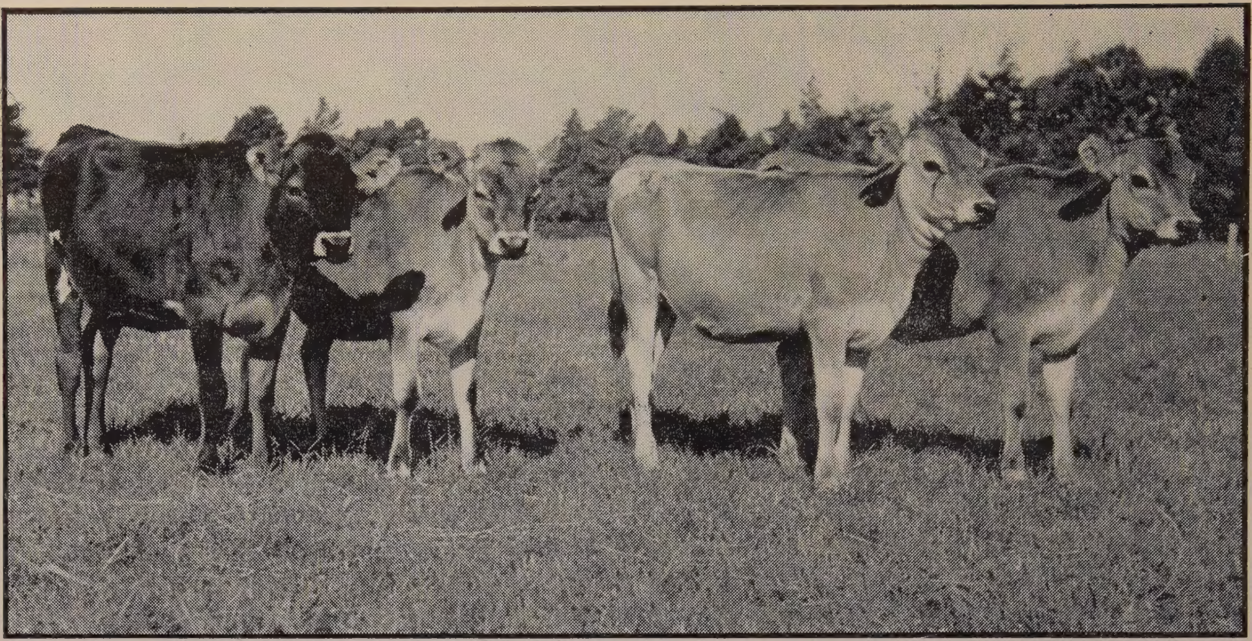

Fig. 4—Eighteen-week-old calves reared under the standard system.

2. Early Weaning (Whole- and Separated Milk)

Of recent years the increasing pressure on the available dairy farm labour force has stimulated the interest of both farmers and scientific workers in the possibility of cutting down the period of hand feeding below 18 weeks, which has usually been regarded as desirable. As a result of careful experimentation at Ruakura, combined with extensive experience with one of the largest Ruakura herds and reinforced by the encouraging results of farmers in the field, methods now commonly described as early weaning or weaning at 8 weeks of age can be recommended under certain conditions. The first method involves the use of both whole- and separated milk. Its special features are:—

1. Whole-milk feeding for the first 3 weeks.
2. Gradual replacement of the whole-milk by separated milk during the next 3 weeks.
3. Separated milk thereafter for the following 2 weeks, with weaning at 8 weeks of age.

The appropriate feeding schedule is set out in Table 3. This system requires 31 gallons of whole-milk and 40 gallons of separated milk per calf.

TABLE 3—EARLY WEANING SCHEDULE (WHOLE- AND SEPARATED MILK)

Feed in pints per feed (twice daily)

Age weeks	Whole-milk	Separated milk
1	3	
2	3½	
3	4	
4	3	1½
5	2½	2½
6	1½	4
7	—	7
8	—	8
9		Weaned
Total gallons	31	40

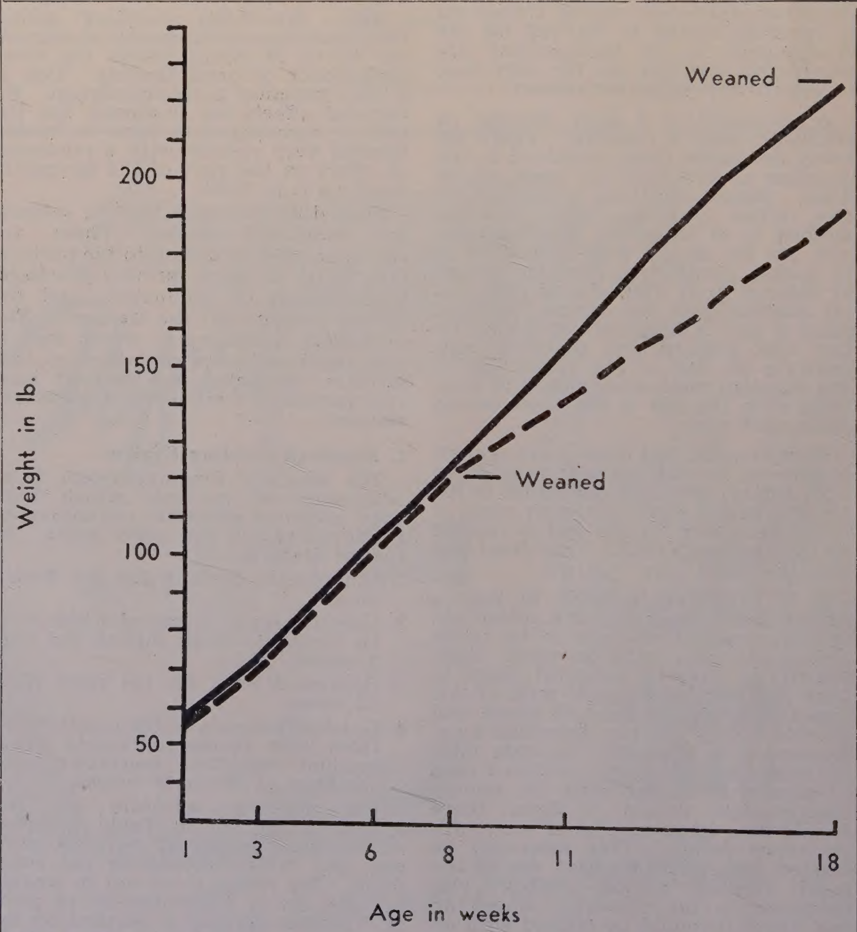

Fig. 5—Typical growth curves of early and late weaned calves. The weight difference will disappear in a few months under rotational grazing management.

Certain precautions are essential in following an early weaning system. Calves that are light at birth will not be sufficiently well grown to wean with safety at such an early age and will require an extra 2 to 3 weeks' feeding. For this reason it has been found that the most practical guide to early weaning is not that the calf should be weaned at precisely 8 weeks, but when it reaches a liveweight of approximately 120lb. As shown by Table 1, this means a chest girth measurement of 33½in.

It has also become very clear from the Ruakura experiments that early weaning cannot be recommended at all unless it is associated with an efficient method of providing pasture. This should be obvious, since in principle early weaning merely involves the substitution of milk by pasture.

Unless the pasture is available in adequate quantities and is of the highest quality, early weaning must fail.

The growth-rate obtainable from early weaning under the system described is illustrated by the curves in Fig. 5. Here, the two systems are compared. The curves come from experiments using identical twin calves, with one member of each set early weaned and its mate late weaned.

As might be expected from the feeding schedules, which are the same up until 8 weeks of age, growth-rate is identical to this point. Thereafter the early weaned calves fall behind until, at normal weaning age of 18 weeks, they are 30lb. lighter. At first sight this difference is serious. It falls below the danger point illustrated by the lower curve of Fig. 2. Indeed, this difference can be highly dangerous unless subsequent grazing management is very good. When this is so the early weaned calves gradually catch up until by the commencement of winter, at about 36 weeks of age, the two groups are indistinguishable.

From results of this type, which are typical of those obtained at Ruakura over the past 3 years, this early weaning schedule is recommended under the following conditions:—

1. On butter factory supply farms where separated milk is available but where its alternative use for pigs is economically important.
2. Where the labour supply is such that a reduction in the time of hand feeding is economically worth while.
3. Where high-quality pastures are available and, most importantly, only where these are used under an efficient rotational grazing system of management.

3. Early Weaning (Whole-milk Alone)

Suppliers of cheese factories and dried milk factories and town supply producers do not have any separated milk. Under these conditions calves are usually reared on milk substitutes. The success of the early weaning work raised the question of whether the continuation of whole-milk feeding for a further month and then weaning might not provide a practical and economical method of meeting the special problems on such farms. Ruakura experiments designed to answer various questions involved in this problem have led to a successful system, the feeding schedule for which is shown in Table 4.

TABLE 4—EARLY WEANING SCHEDULE (WHOLE-MILK ONLY)

Age weeks	Constant ration pints per feed a.m.	p.m.	Alternative ration pints per feed a.m.	p.m.
1	3½	3½	3½	3½
2	3½	3½	3½	3½
3	3½	3½	3½	3½
4	3½	3½	3½	3½
5	3½	3½	7	—
6	3½	3½	7	—
7	3½	3½	7	—
8	3½	3½	7	—
9	Weaned		Weaned	
Total milk ..	49 gallons		49 gallons	

One special feature should be noted about this system. In contrast to the previous two methods, the schedule calls for a standard ration of 7 pints of whole-milk per day from birth to weaning at 8 weeks irrespective of the size or age of the calf. From a practical viewpoint this is a much simpler method than a variable ration, which increases as the calf gets older. That this is capable of producing results just as good as a variable ration is shown by the growth curves of Fig. 7, where the performance of calves on a ration increasing with age is compared with the performance of animals under the standard ration recommended. The total amount of whole-milk required under this system is 49 gallons per calf.

A further simplification may be used where the labour of feeding is a real problem. After the first month the whole of the 7 pints can be given in one feed. No harmful effect is likely to result from this modification, which saves the labour involved in a second feed at a time when the pressure of silage making can be heavy on the available labour force. As a means of applying the early weaning technique and of avoiding the use of purchased milk substitutes, this method of using limited amounts of whole-milk alone is simple, straightforward, and, if properly applied, can be expected to produce the kind of calves illustrated in Fig. 6.

As in method 2 the same precautions, however, must be taken if calves of this type are to be grown. Weaning should be not specifically at 8 weeks of age but at 120lb. liveweight. This weight will be reached in 8 weeks by the average calf, but an additional one or two weeks may be required by animals below average birth weight. Like method 2, it will fail unless a rotational grazing system of pasture management is followed along the lines indicated later in these articles. Accordingly, method 3 is recommended under the following conditions:—

1. On cheese, dried milk, and town supply farms where separated milk is not available.
2. As an alternative to the use of milk substitutes.
3. Where pastures are of high quality and only where rotational grazing management is practised.

4. Use of Milk Substitutes

Dried skimmed milk powder and dried buttermilk powder are the two most readily available milk substitutes

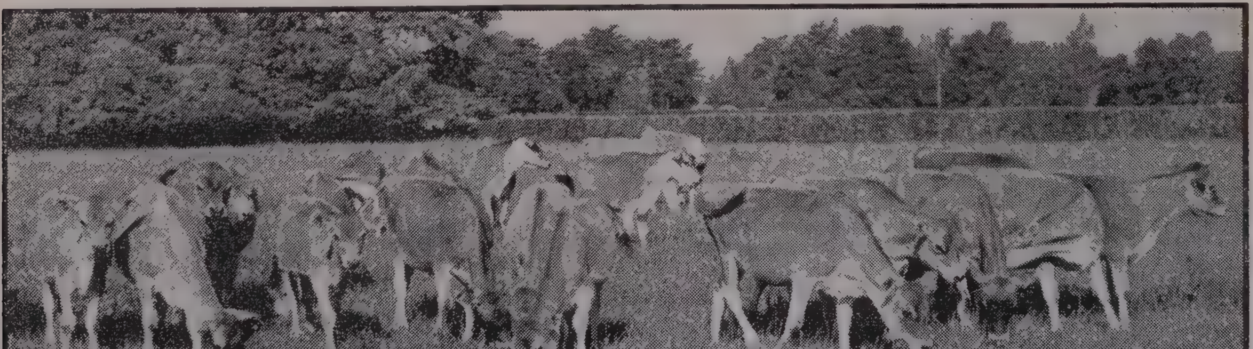

Fig. 6—Early weaned calves from the No. I herd at Ruakura in the 1952-53 season. The photograph was taken when the calves were 20 weeks old.

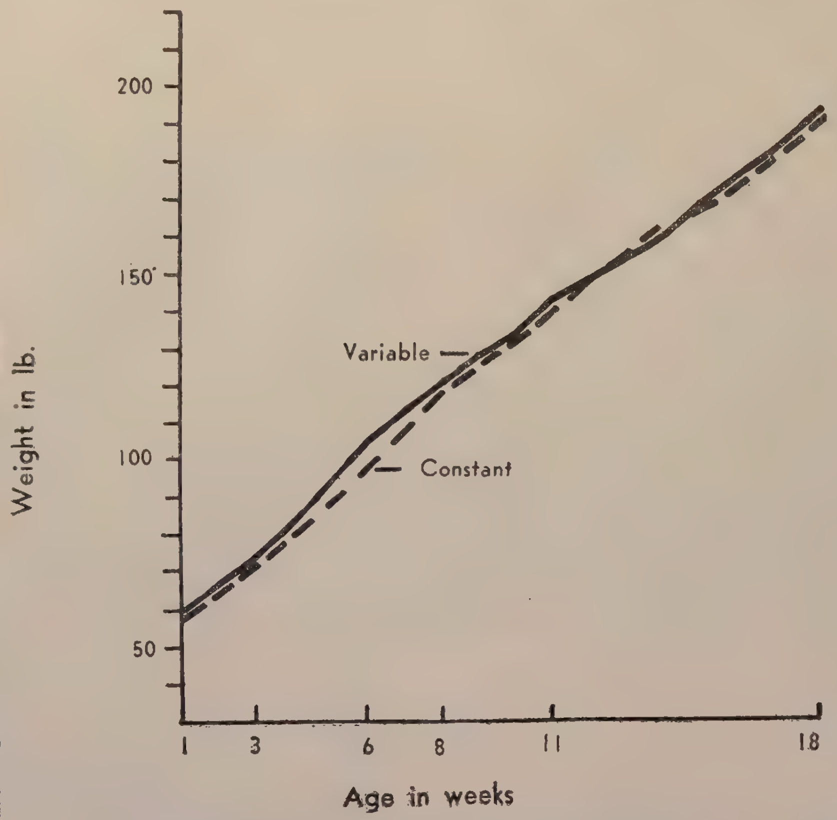

Fig. 7—Growth curves showing the same growth from a constant ration of 7 pints of whole-milk a day and a variable ration increasing with age.

in New Zealand. They are frequently used by whole-milk suppliers as calf feeds. Though method 3 is recommended for preference on such farms, both these powders can be used with any of the three milk feeding schedules described. In doing this 1lb. of the powders can be taken as approximately equal in feeding value to 1 gallon of separated milk, with 2lb. being equivalent to 1 gallon of whole-milk.

When powders are used sufficient water should be added to each pound of powder to make up 1 gallon of the mixture. They should not be used during the first month, during which time it is much safer to use whole-milk. Thereafter, however, when mixed in the proportions indicated, they can replace either whole- or separated milk, pint for pint, in the various feeding tables shown.

Apart from the fact that the use of milk powders requires extra time and trouble in mixing and rationing the correct quantities, the decision whether or not they will be used probably depends largely on relative costs. The table below compares the costs of feed for the various alternatives available. In each case the figures apply to weaning at 8 weeks. Whole-milk is valued at 1s. 6d. per gallon on the butter factory supply farm and 2s. per gallon on the whole-milk supply farm.

Of these, method 1, using whole- and separated milk and weaning at 8 weeks, shows the lowest cost. Thus the butter factory supplier with separated milk available will not be interested in milk substitutes. The whole-milk supplier will produce calves most cheaply by weaning at 8 weeks on whole-milk and buttermilk powder (method 4). There is little difference in cost between whole-milk alone and whole-milk and skimmed milk powder (methods 2 and 3). If all factors are taken into consideration, the simplified whole-milk feeding system of 7 pints per day for 8 weeks (method 2) is well worth while on such farms.

Reference has been made in the introduction to this article to the fact that it is unnecessary to use meals in the feeding of calves during the hand feeding period. This statement is supported strongly by the workers of Massey Agricultural College and the Dairy Research Institute who have shown that no advantage in rate of growth is obtained by replacing part of the milk ration with high-quality concentrate grain meals. Since in these experiments the rate of growth of calves fed milk alone was at a highly satisfactory level and comparable with the "good" growth curve of Fig. 2, this conclusion is inevitable. These experiments with meals were all carried out under conditions where the calves were provided with continuous access to high-quality pasture on a rotational grazing plan.

TABLE 5—COMPARATIVE FEED COSTS FOR EARLY WEANING

Method	Whole- and separated milk (1)	Whole-milk (2)	Whole- and dried milk powder (3)	Whole- and butter-milk powder (4)
Quantity	31 gal. and 40 gal.	49 gal.	31 gal. and 40lb.	31 gal. and 40lb.
Cost per gal. or per lb.	18d. and 2d.	24d.	24d. and 9½d.	24d. and 6¾d.
Total	53s. 2d.	98s.	93s. 8d.	84s. 6d.

It is quite evident that, provided calves are given milk at the levels shown in the different feeding schedules described and provided they are supplied with good-quality pasture, it is quite unnecessary to supply any concentrate supplement.

This does not mean that meals are of no value to calves. Calves are reared almost entirely on such fodders in other countries. Fed to calves in New Zealand, meals undoubtedly will produce good results. What the statements do mean is that in this country they are a very expensive substitute for good-quality pasture, which is by far the cheapest form of cattle food available on any farm.

Feeding Management

The period of hand feeding unavoidably involves a considerable amount of labour. On the modern, streamlined dairy farm well-planned calf feeding facilities have to be provided if this labour requirement and cost are to be cut to a minimum.

Good facilities for rearing calves must fulfil the following conditions:—

1. Protection for new-born and sickly calves for the first few days of hand feeding.
2. Individual feeding bails and yards which are easily worked and cleaned.
3. Handiness to the supply of milk so that a minimum of hand cartage is required.
4. Protection of the worker from inclement weather so that the job is never dodged and that calves always will be fed.

A practical and efficient layout meeting all these requirements is that now employed at each of the five dairies at Ruakura, where hired labour has to be depended on for this critical work. Here the calf feeding unit is designed and built as an integral part of the dairy shed. Fig. 8 shows the ground plan of a typical Ruakura unit with the calf yards, feeding bails, and calf pens under cover and immediately adjacent to the separator room. All key measurements are shown. Fig. 9 shows a picture of one of the sheds so equipped. Fig. 10 gives detailed specifications of bails which, ideally for cleanliness, should be made of welded pipe. Fig. 11 shows a modified ground plan using this type of layout for a shed where only a separator room is attached to the milking portion. A plaster finish to floors and walls to a minimum height of 4ft. is essential in the interests of cleanliness.

This type of layout was first installed at Ruakura in one shed about 10 years ago. It proved so convenient in operation and removed so many of the practical problems normally associated with the regular and careful feeding of calves that it has been adopted as a standard layout in every dairy. In particular it permits a high standard of hygiene, essential to the maintenance of healthy calves. It can be thoroughly recommended to any dairy farmer seeking all-round efficiency in the utilisation of his labour force and minimum trouble in his calf rearing methods. It is much to be preferred to the detached type of layout or to a system which requires feeding calves in the open air.

In the advancing of these ideas on feeding management it is taken for granted that individual feeding is accepted by farmers as a prerequisite to continued success in calf rearing. It is true that some farmers are able to rear calves from a common feeding trough and that many still continue to use such primitive methods. The risk of infectious diseases, however, is so great under such conditions that the practice cannot be too strongly condemned.

Grazing Management

The widespread belief of many scientists and farmers that pasture is of little value to a dairy calf before the age of 6 months is so contrary to New Zealand experience that detailed studies of some of the issues involved have been made at Ruakura. Grazing habits have been observed from an early age; calves of different ages have been slaughtered and their stomach development measured; rumen or paunch development has been compared in milk- and grass-fed calves and in early and late weaned animals; the capacity of calves to digest pasture has been measured.

From these studies several facts of basic importance emerge which explain why calves can make good use of high-quality pasture if allowed to do so. These facts also help to define the conditions necessary for good calf rearing on milk and grass.

1. Calves start to ruminate as early as 7 days, and rarely later than 3 weeks. Pasture is consumed from this point.
2. By 3 months the calf has a rumen which in relation to its body weight is as large as that of an adult cow. It becomes relatively larger at 5 months.
3. Calves fed grass in addition to milk show better rumen development than purely milk-fed calves. The more grass is consumed the more rapid is the rate of growth of the rumen.
4. Early weaned calves (8 weeks) subsequently show more rapid development of the rumen than late weaned calves (18 weeks) and are thus able to handle pasture better at the same age.
5. At 8 to 10 weeks of age calves can digest the dry matter of good-quality, young, leafy pasture with the same efficiency (74.6 per cent.) as adult cows (75.2 per cent.).
6. After early weaning (8 weeks) calves require 5 to 7 hours' grazing per day on high-quality pasture to obtain sufficient nutriment to grow at a reasonable rate.
7. On poor-quality, fibrous pastures calves have to graze longer, waste time in searching for suitable food, and ruminate longer in a vain attempt to satisfy their needs on such indigestible material.
8. Calves are highly selective grazers and tend to starve themselves on unsuitable pastures.

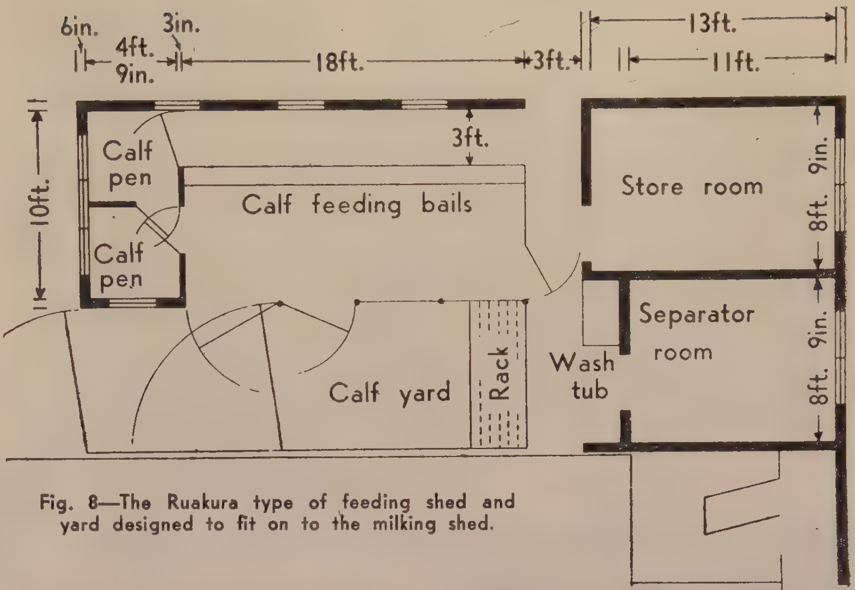

Fig. 8—The Ruakura type of feeding shed and yard designed to fit on to the milking shed.

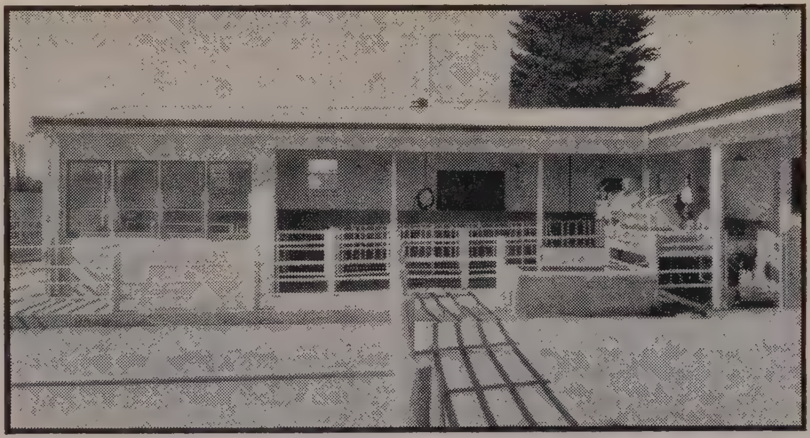

Fig. 9—One of the calf feeding units at Ruakura built basically to the ground plan of Fig. 8. A plaster finish reduces labour, improves hygiene, and reduces disease.

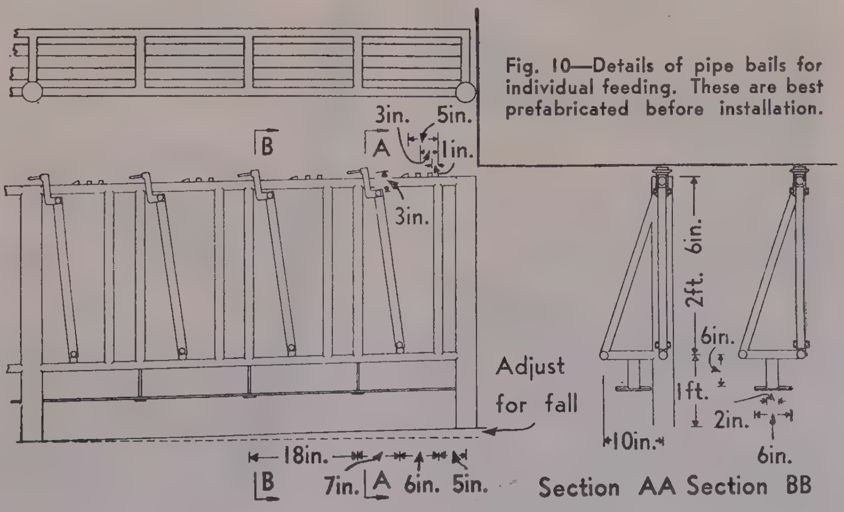

Fig. 10—Details of pipe bails for individual feeding. These are best prefabricated before installation.

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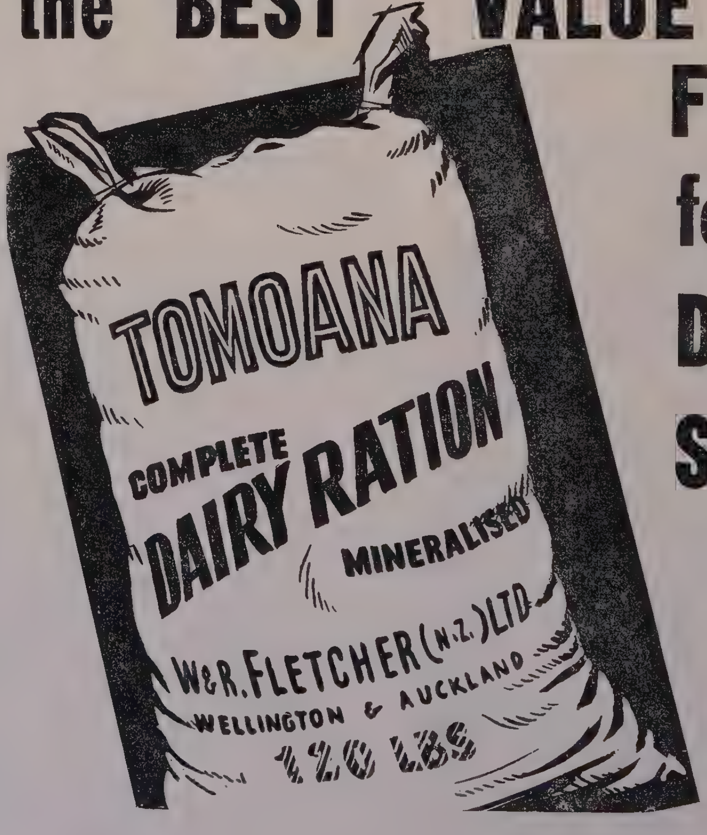


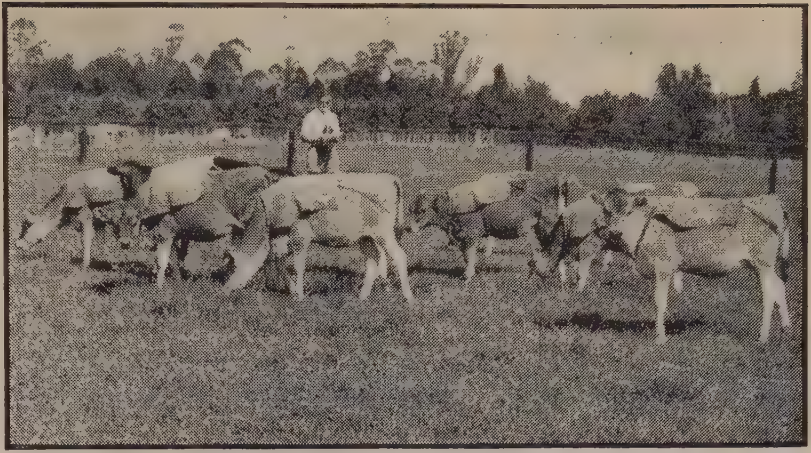


Fig. 12—Calf watching. By observation of grazing behaviour basic information on the use of pasture by calves has been obtained.

The system of grazing management practised must obviously be a key factor in successful calf rearing. Grazing methods have been the subject of intensive study at Ruakura for the past 10 years. The results of these studies have been so clear cut and so uniform from year to year, independent of the type of season experienced, that definite recommendations can be made without qualification.

The calf paddock system of grazing management cannot be too strongly condemned. Such a paddock is usually too small to be successfully controlled by older and other types of stock and in consequence usually carries one of the poorest pastures on the farm. A set stocking system of grazing is unavoidable. Owing to the selective grazing habits of calves the sward soon becomes a mosaic of long and short patches of feed, with the former too rank, too unpalatable, and too indigestible to be of any use to calves, and the latter too closely and too continuously grazed to yield sufficient feed for them. (See Fig. 13.) The heavy concentration of calves on the area leads to a heavy infestation with worms and other parasitic organisms, with a constant threat to health.

No matter how efficient the milk feeding system may be, calves reared from birth to weaning in single calf paddocks slow down in their growth-rate as they approach weaning at 16 to 18 weeks, and in their coats and condition show increasing signs of unthriftiness. As will be described in the next article in this series, such tendencies become of increasing importance after weaning, particularly when set stocking management is continued. The calves shown in Fig. 14 were photographed just before weaning. They are typical of the kind of animals invariably produced at Ruakura over 10 successive years in tests of the calf paddock system.

Ruakura Rotational Grazing Management System

To overcome these defects the Ruakura rotational grazing management system has been developed. In its best and most advanced form calves are rotated round the milking pastures, commencing at 2 to 4 weeks of age. A fresh paddock is provided each day. This fits a daily shift of the milking herd, with the calves going into their new field a week to 10 days before the herd. This provides them with young, leafy herbage that is palatable, highly digestible, and nutritious. They are able to exercise their selective grazing habits to the full and to satisfy their appetite with the type of feed of which they can make best use. Since a much greater total area of the farm is covered in the process, the concentration of calves per acre over the total hand feeding period is only a fraction of what it is in a single calf paddock, so that the risk of heavy parasitism and other infections is greatly reduced. Though calves grazed in this way do pick up worms, their plentiful feed supply and highly thrifty condition enable them completely to withstand the effects of any such parasites. Drenching is completely unnecessary.

During the 10 years this rotational method has been under test, the type of cattle illustrated in Fig. 15 has resulted. This photograph was taken at the same time as Fig. 14. The two groups of calves shown were closely comparable at birth, were all by the same bull, and were all fed exactly the same amounts of whole- and separated milk for 18 weeks. The differences are striking. The important point is that these have resulted solely from grazing management.

Rotational grazing management as described does involve a small amount of extra labour. The calves have to be brought in twice daily for feeding and returned to the milking pastures. Initially it was thought that this would be a serious bar to its widespread use by farmers. Dairy Board surveys, however, indicate that over 50 per cent. are already following the system to some degree. The balance could do so with advantage. Calves are quickly trained to follow the routine and on a well-managed dairy farm subdivided into 17 to 20 paddocks and where the herd is also managed on a controlled rotational grazing basis good planning can reduce the work to a level where no real burden exists.

From what has been said it should be obvious that the system of grazing management is of paramount importance in early weaning. The calf which is weaned at approximately 8 weeks must thereafter gain the whole of its nutriment from pasture. It cannot do so unless this pasture is of high quality and is available in sufficient amounts. At 8 weeks the rumen, relative to body size, is not fully developed. This makes the position even more difficult and is probably responsible for the slight falling off in growth-rate of early weaned calves compared with later weaned mates during the first few weeks. With a small rumen and a high nutritive need it is thus imperative that highly digestible grass is offered to such animals. If this is done, they quickly adjust themselves to complete dependence on grass and will grow well with no troubles.

The easiest way of providing pasture of a suitable type is by the rotational grazing system described. Indeed, unless this system is used on a careful and strict basis, early weaning cannot be recommended despite its many advantages.

Unthrifty calves, high losses, and grave disappointment are the experience of farmers who do not provide very good rotational grazing management for early weaned calves. For this reason early weaning cannot be recommended at all to farmers who are already experiencing trouble with standard feeding systems. Fig. 6 shows the calves at No. 1 Ruakura Dairy in the 1952-53 season. These were fed whole-milk only and weaned at 120lb. They were grazed rotationally round the milking pastures from 2 weeks of age This exerted no obvious harmful effect on milk production of the herd. The 126 acres of this farm carried 120 milking cows, 34 yearlings

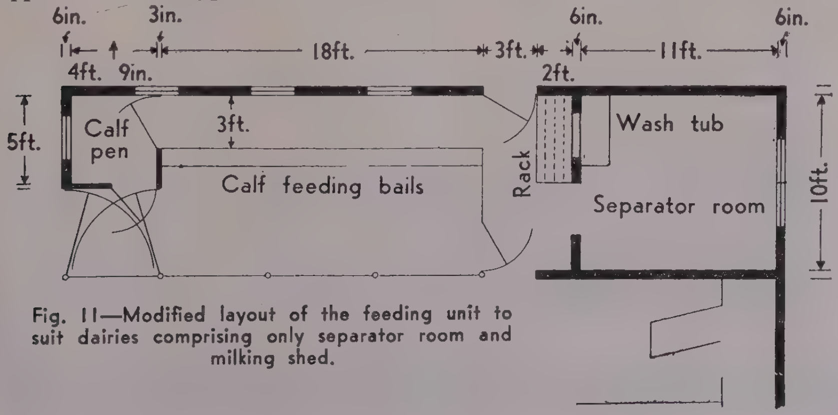
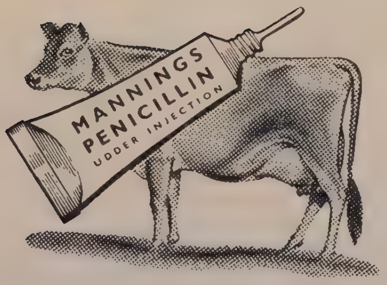


Fig. 11—Modified layout of the feeding unit to suit dairies comprising only separator room and milking shed.

how to dry-off a clean herd—



Treatment against Mammitis at drying-off time is a vital factor in bringing back a clean, healthy herd.

Any quarters which show signs of Mammitis and all those that have had Mammitis at any time during the season should be given three tubes of Mannings 50,000 strength Penicillin at 24-hour intervals. Give the third tube after the final milking when the cow is turned out.

Bad or obstinate cases should receive Mannings 100,000-strength Penicillin.

If there has been a lot of Mammitis in the herd during the season we advise treating the whole herd with at least one tube of Mannings 50,000-strength Penicillin injected into every quarter at the final milking.

Properly used – and it is perfectly simple to use – Mannings Penicillin will effectively deal with all cases of Mammitis. Teat injury is avoided with Mannings because you have the advantage of the smooth, specially rounded end on their extra thin smooth nozzle.

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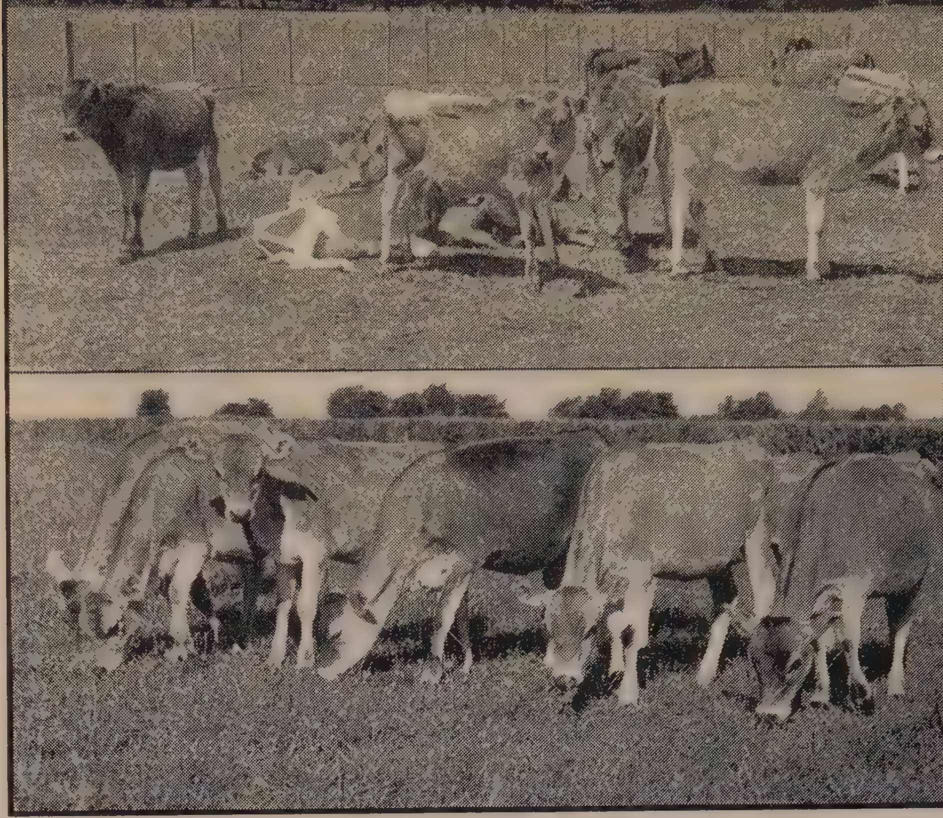


Fig. 14 (upper)—Typical calf paddock calves shortly before weaning at 18 weeks. Despite their good size they show signs of unthriftiness. Fig. 15 (lower)—Typical rotationally grazed calves shortly before weaning. Note the glossy coats and good condition as well as size.

Maintenance of Health

During the birth to weaning period calves in New Zealand are likely to meet three main hazards to health. These are calf scours, redwater, and pneumonia. Other specific troubles may also be encountered at this period as well as at any other stage during the growing period. These latter troubles are covered in the final article in this series.

Calf Scours

Calf scours are by far the commonest disease affecting calves during their first 3 months of life and are the commonest cause of loss during the first month. The term is a loose one and is used to cover the whole range of diseases involving the passage of watery faeces, coupled with loss of condition and general unthriftiness. Attempts are often made to differentiate between "white" scours and "blood" scours. Such a classification is completely arbitrary and gives no definite indication of the primary cause.

For all practical purposes "scours" should be considered a complex entity due to infections, to nutritional upsets, or to a combination of both factors. It is impossible in practice to decide the precise cause merely from an observation of symptoms, so that the treatment used is based on the assumption that both factors are involved.

Very acute forms of the disease may kill rapidly and before treatment can be applied. More commonly, however, a marked loss of "bloom" and failure of appetite occur. In these latter cases treatment can be effective. As soon as scouring is noticed food must be withheld for 24 hours. Thereafter the calf should be brought back gradually to its full milk diet by being given a ration of water and glucose with gradually increasing quantities of milk, depending on its response. One of the appropriate sulpha drugs should be obtained on veterinary advice and administered immediately. The sulpha drugs are usually very effective, especially when used during the early stages of the disease. A careful watch should therefore be kept for any sign of such trouble, particularly during the first 2 weeks after birth.

Since the disease is infectious and can be passed from calf to calf through contaminated pasture, feeding buckets, bails, and surroundings, affected calves should be isolated until cured and all equipment thoroughly cleaned and disinfected. The type of layout and equipment already recommended makes it easier to keep the occurrence of scours to a minimum by good hygiene.

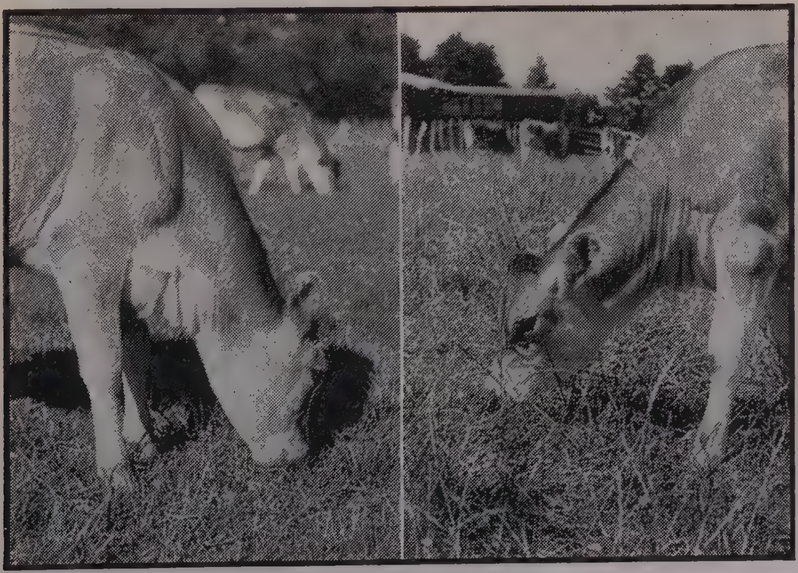


Fig. 13—Left: Suitable pasture for calves; short, leafy, digestible, and nutritious. Right: Unsuitable; long, mature, fibrous, and indigestible. Calves will not grow well if left on this feed.

Redwater

An acute disease of calves, redwater has been recognised for many years, but it is only recently that the causal organism has been identified. It affects groups of calves rather suddenly and unless treatment is begun in the early stages, the death-rate may be very high. The organism responsible is known as *Leptospira pomona* and thus the disease is now designated leptospirosis. Young calves from a week of age up to 4 months are generally affected. Onset is sudden and death may occur before the farmer has noticed any symptoms. On the other hand, calves may linger for several days.

The usual signs are that calves refuse to feed and become dull and lethargic, with rapid breathing and high temperature. Yellow-jaundiced membranes are seen under the eyelids and in the mouth. Blood-stained, port wine-coloured urine is passed. The latter symptom may be the only one seen. Calves which recover usually take many weeks to regain body weight and normal health.

It is possible that urine from infected animals is the most prolific source of infection, and care should be taken to disinfect all calf pens, bails, and utensils. Some of the modern antibiotic drugs such as streptomycin and aureomycin are very helpful in treating redwater. Veterinary advice on the handling of this disease is essential.

It should be stressed that redwater is a disease communicable to man, so that special care should be taken to ensure that infection is not picked up through cuts and abrasions in the skin or through the mouth. Scrupulous attention to washing of the hands after calves affected with leptospirosis have been handled, or after post-mortem examinations have been carried out is advised. Smoking by a person while feeding or handling infected calves is also dangerous. Children should not run bare-footed on infected farms.

Pneumonia

Pneumonia may affect calves of all ages, though the highest incidence occurs in younger calves during July to September. Contrary to popular belief, actual cold conditions do not cause pneumonia, but wet, draughty conditions, as are frequently found under old pine or macrocarpa shelter belts, are conducive to severe chilling, which allows bacteria free range in lung tissue. Any condition such as calf scours or worm infestation which markedly lowers body resistance to infection can act as a predisposing cause.

Symptoms of pneumonia are dullness, loss of appetite, cough and fast breathing. Temperature is usually elevated to up to 106 degrees F. A purulent discharge may be seen at the nose and bubbling or gurgling sounds heard in the chest cavity. Frequently the calf stands for long periods with neck extended.

Unless treatment is instituted early, the death-rate may be high. Affected calves should be removed to warm, dry conditions under cover with plenty of dry hay or straw as bedding. Calves should be tempted to drink as much milk as possible by their own efforts. Drenching with large quantities of fluids in pneumonia cases is extremely dangerous. Inefficient drenching can cause pneumonia. Penicillin and other antibiotic drugs are very efficient in treating pneumonia. Injection of one of these as early as possible will effect a rapid cure in most cases.

Dehorning

Though hardly a disease, the presence of horns on dairy cattle is a constant threat to the health of other members of the herd. Many cows lose quarters and suffer wounds through horning. All calves intended for dairying should be dehorned. Within 3 weeks of birth is the easiest time at which to perform the necessary operation.

The most efficient technique is to use an electric soldering iron fitted with a special calf-dehorning head. Alternatively this head is easily made by hollowing out a concave end to an ordinary soldering iron so that the horn bud can be covered and destroyed by a few seconds' application of the hot iron. Caustic soda stick rubbed on the horn bud is effective, but is subject to the danger that adjacent skin areas may be burnt if the caustic soda runs as a result of rain or an over-application.

Eighth Science Congress to be Held in Auckland in May

THE expansion of agricultural science has been so rapid in recent years that delegates to this section of the Royal Society of New Zealand's Science Congress now form the largest assembly of all, and at the coming Congress next month the science of the soil has been made a separate section, and agriculture and forestry have been divided into agriculture, forestry, and horticulture.

The 1954 Science Congress, which is the society's eighth, is to be held in Auckland from 17 to 22 May and will be centred on Auckland University College.

The Congress is divided into sections dealing with the following sciences: Physics, chemistry, botany, zoology, geology, geography, medicine, sociology, anthropology, architecture, and engineering, agriculture, forestry, and horticulture, and soil. However, many delegates to the Congress attend lectures in various sections and to encourage this a number of symposia have been arranged so that matters which have a common root in many sciences can be discussed by joint sessions of the sections concerned.

Those who are interested in scientific thought should find the Congress a valuable experience.

Further details can be obtained from local officers of the Department of Agriculture or from the Auckland Institute and Museum.

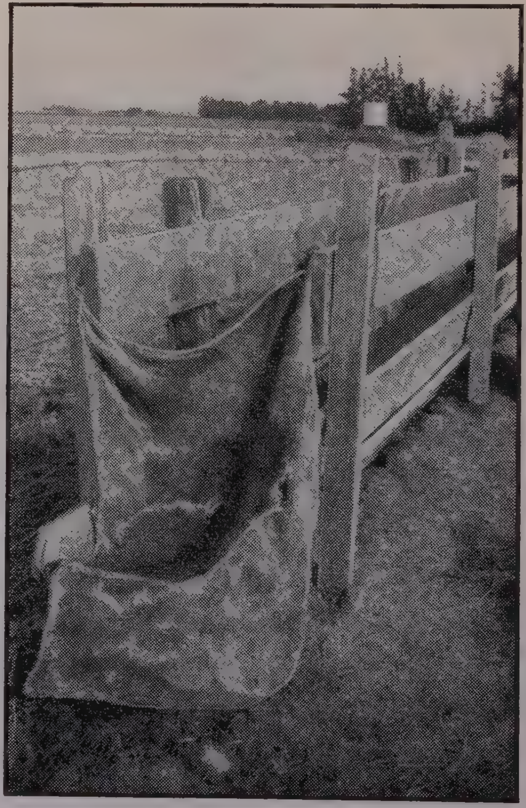
Arsenical Poisoning of Ewes

By C. A. MARTIN, Livestock Instructor, Department of Agriculture, Tapanui

THE illustration at right shows a temporary foot-rot trough set up in the corner of a good pasture paddock. The farmer concerned, in accordance with good ewe management, had drafted 300 old ewes off the turnips approximately 5 weeks before his ewes were due to begin lambing and to prevent ante-partum paralysis had put 100 in each of 3 good grass paddocks. Three days later he found 5 sheep dead in one paddock and 5 others obviously affected. He assumed that the trouble was milk fever and injected those affected with calcium borogluconate with negative results. The 5 affected died, and the following morning a further 10 were dead; 20 good ewes had died in one paddock under similar circumstances, so he moved the remaining 80 out of this paddock and sought the assistance of his local Livestock Instructor.

Investigations revealed the foot-rot treatment trough illustrated in one corner of the paddock. This trough had not been used for some time, and as the weather was hot and dry, the farmer had added water to the arsenical foot-rot sludge already in the trough so that it would not be damaged by the dryness. At the same time he had nailed a sack over the end of the trough to prevent sheep having access to the fluid. When the ewes came off the turnips the weather was extremely hot and dry and they were probably more thirsty than usual. No water was available for them in the paddock, and they pushed the sack back into the trough so that a basin was formed into which arsenic-charged fluid seeped. The ewes consumed this fluid and died of arsenical poisoning.

Farmers may say that these deaths were the result of carelessness, but they could happen on many farms. For this farmer it was certainly an expensive experience and one which proved that all farmers must take the utmost care with any poisonous materials used on their farms.



Planning Needed in Planting an Orchard

PROFITABLE production of fruit needs long-term planning, which should begin before the trees are planted. In this article G. S. Northcote, Horticultural Instructor, Department of Agriculture, Motueka, discusses some of the aspects which should be considered before planting begins and various practices necessary to the successful establishment of an orchard.

A FRUIT tree will grow and produce fruit in a wide variety of soils and under all sorts of conditions. However, in the plan it is advisable to attempt to provide the optimum conditions required by each variety so that the best results may be obtained. Fruit trees do not bear for some considerable time after they are planted, but will then continue to bear profitable crops for many years if they have been planted in a suitable environment and have received adequate care and attention.

Soil

Though fruit trees prefer a good type of friable loam as a topsoil, probably the subsoil is the more important feature. It should be of clay or silt and sufficiently porous to allow good drainage. Land with an ironstone pan or a puggy subsoil must be avoided, because tree roots cannot penetrate such soils, and poor drainage and a high water-table in winter prevent good root development. Provided it drains well, a fairly heavy clay subsoil will hold sufficient moisture to keep the trees healthy over all but the worst drought periods. Trees which have their roots in water for part of the year are the first to suffer from the slightest dry spell, and those planted in a shingly subsoil will require irrigation in drought conditions.

Apples thrive best in the soil described; pears, plums, and quinces will stand slightly wetter conditions. However, it must be stressed that they will not thrive if their roots are waterlogged for any length of time. Many people think that pears, quinces, and plums can be planted in a really wet spot. This is not correct, as they must have good drainage too.

Peaches and nectarines will not stand the slightest amount of excess moisture round their roots. They can be planted quite successfully on an alluvial type of soil even though it has a shingly subsoil, as the crop can often be harvested before drought conditions occur. It is advisable to be prepared for irrigation if the subsoil is too open.

Apricots are more temperamental and though they grow well in most well-drained soils, they seem to crop regularly only in the schist rock soils and under dry conditions such as are found in Central Otago.

Drainage

Great stress has been laid on a well-drained subsoil. If the land is not naturally well drained, it would be better not to plant fruit trees on it. Maintenance of drains in an orchard is expensive and arduous. Open drains can be used only round the boundaries of orchard blocks and the intermediate drains must be underground tile or mole drains. Tile drains are expensive to lay and liable to blockage from tree roots or breakage from heavy implements, and mole drains have to be constantly repulled and do not always operate successfully.

If it is considered essential to plant land which does not drain freely, the drains should be laid before any planting is done and a careful plan must be drawn so that it can be referred to in later years.

Site

The land should be level or have a slight slope toward the north. An orchard on steep slopes is difficult to work and very liable to erosion. The area selected should be free from late spring frosts and not be situated in a frost pocket. Cold air will flow down like water and will build up in low-lying areas. It will also build up against a shelter belt planted across a slope. Therefore it is almost as important to locate the orchard with regard to air drainage as it is to have good soil drainage.

Shelter

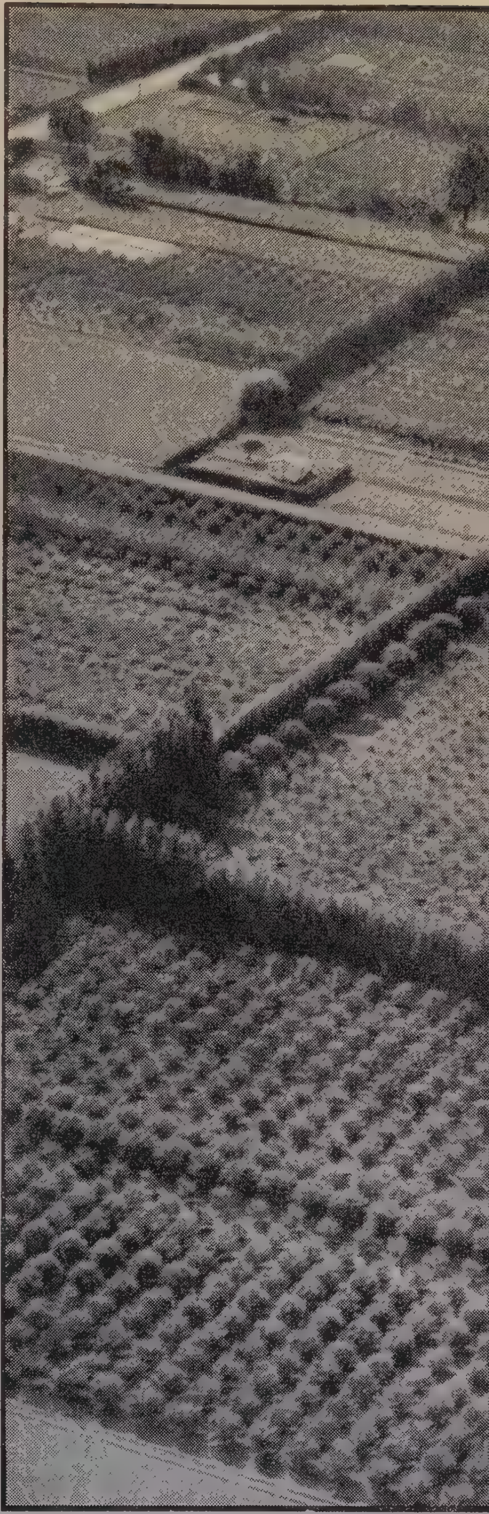
Fruit trees will not thrive if exposed to strong winds, which cause trees to grow away from the prevailing wind and damage both fruit and branches. It is preferable to select an area which is naturally sheltered by surrounding hills. If this cannot be done, it is essential to establish belts of shelter trees some time before the orchard is planted. In Nelson Province orchards thrive without shelter. Nearly all the pines originally planted as shelter belts round the orchards have been cut down and the fruit trees seem to do better without them. In Hawkes Bay the most prominent features of the landscape are the rows of poplars sheltering the fruit trees from strong winds. Poplars are very useful because of their quick growth and deciduous habit.

Varieties

Many lists of recommended varieties for various districts have been published from time to time and it is not intended to repeat them here. Small growers or home gardeners should consider the work involved before planting fruit trees. Apples and pears do not bear fruit for a number of years and need careful and consistent spraying before clean sound fruit is produced.

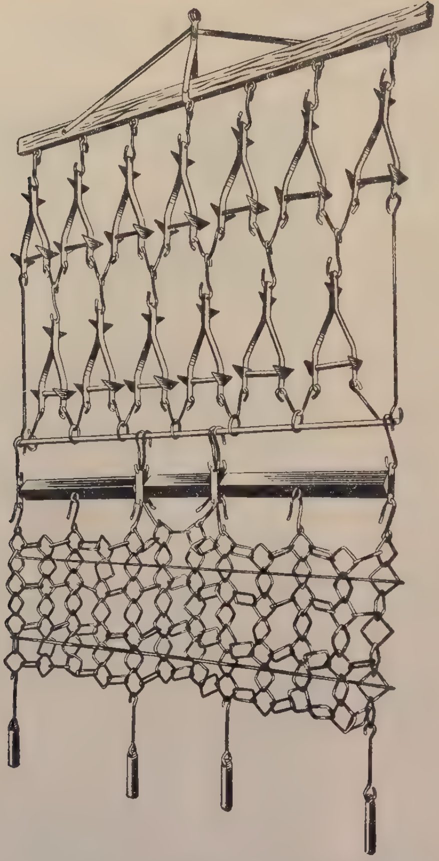
Unless a grower is prepared to spray thoroughly as many as 12 times a season, he would be well advised not to grow pip fruit trees.

Home gardeners generally would have more satisfaction from peaches, nectarines, and plums, which give a quicker return for less effort. Whatever varieties are to be planted it is well worth while to obtain only the best trees from a reliable source.



[V. O. Browne

The symmetrical planting of orchards on the square system and the use made of shelter belts in Hawkes Bay.



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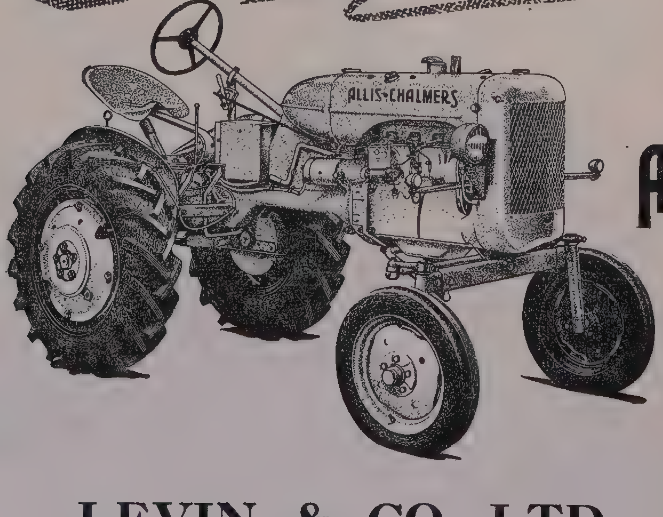

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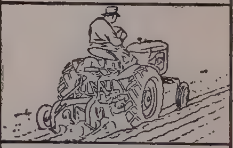

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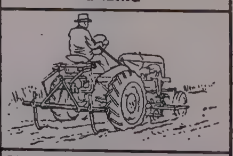

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Preparation of Soil

When planted the trees will be occupying the same position for many years, so the soil should be prepared thoroughly before they are planted. All perennial weeds, particularly couch grass and docks, should be eliminated by cultivation or by spraying with chemicals before planting begins. It is well worth while to break the subsoil without bringing it to the surface by using a pan-buster or by ploughing a second time in the same furrow without a mould board on the plough. If the topsoil is not very fertile, successive cover crops of lupins, oats, or ryecorn should be grown and worked into the soil. Time spent in adequate preparation of the land will be well repaid in subsequent years.

Laying out the Orchard

In a mixed orchard careful planning should be done to place each type of fruit in the conditions best suited to its requirements. As different types of sprays are required, on no account should stone fruit be interplanted with pip fruit.

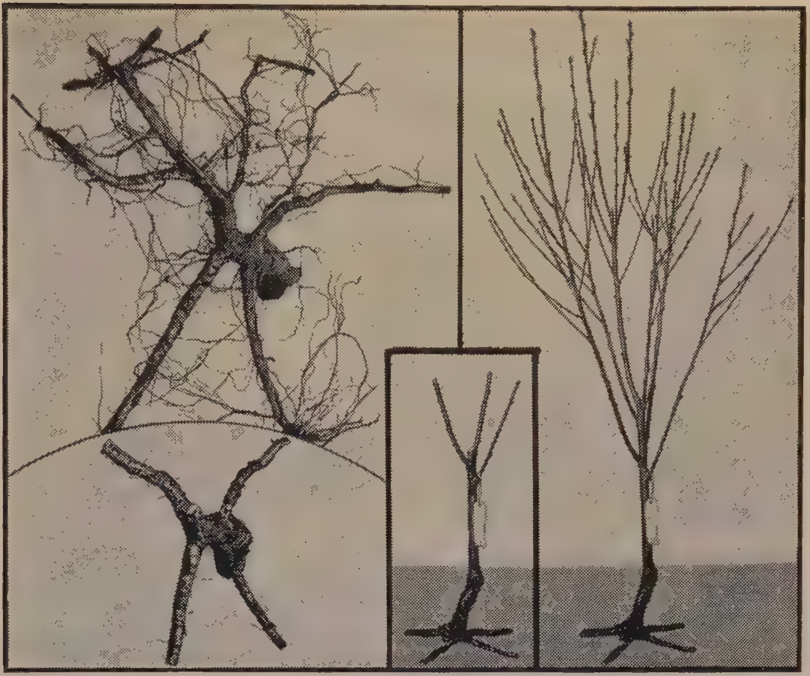
Cross-pollination between varieties must be carefully studied before trees are planted. This is a very important feature in the planning of an orchard and advice should be sought from the local Department of Agriculture Horticultural Instructor, who would prefer to give advice before mistakes are made rather than to endeavour to rectify them later.

To simplify spraying operations and cultivation the orchard should be planted on the square system. This is done by taking a straight base line along the boundary fence and setting off the two ends by the 3 : 4 : 5 triangulation method to make sure of the right-angles. If the area to be planted is irregular, the largest possible square should be marked off out of it and the odd corners can be filled in afterward. Planting distances depend on the soil type and the stock used. On a rich soil where the trees are likely to grow very big 24ft. apart each way would not be too great a distance; on a poor soil it is better to plant as close as 16ft. Even in the home garden trees should be at least 12ft. apart and preferably more. Planting too close is one of the greatest faults. All trees and plants must be spaced so that they can receive sufficient light and air to make good growth. These elements are essential to plants to ensure the building of healthy plant tissue, including flowers, foliage, wood, roots, and fruit.

The area to be planted should be marked out with a stake placed in the position to be occupied by each tree. If this is done correctly, each stake should be in line in all directions; that is, up the row, across, and on the diagonal. This enables cultivation to be carried out all ways with implements and minimises the amount of hand work to be done round the trees. Each tree should be an equal distance from its neighbour on the square; the diagonals will, of course, be longer.

Treatment of Trees

When the trees arrive from the nursery they should be heeled in immediately by digging a trench, lining the trees into it, throwing back the soil, and heeling the trees down. They will then keep in good condition until the area is ready for planting. Trees should not be left lying about in their transit package. Often the roots have been damaged in transit, and damaged parts should be cut off when trees are being heeled in. In any case it is advisable to trim off the fibre and any roots that are too long. The fibrous part will only rot when planted, so it is better to give the roots a clean, fresh start.



[*Sparrow*

Left—The roots of a young peach tree as received from a nursery and after being trimmed. Right—The tree with its top unpruned. Middle—The top pruned back to three well-balanced main shoots.

Planting

On a light well-drained soil planting can be carried out at any time that the soil is workable. This is one reason for planting peaches in a lighter soil, because they blossom in late August and should be planted not later than July. Plums must also be planted early; it is preferable to plant them in the autumn before the soil becomes too wet and sticky during winter. Apples and pears are best planted in August as soon as the ground is workable. It is better to delay planting rather than to work the soil when conditions are unsuitable. A tree planted in a wet, heavy soil can have a ball of clay round its roots which it will be impossible for the young, new roots to penetrate. Young pear trees, which are often situated in

[*National Publicity Studios*

A young orchard in Nelson district. This system of planting allows for cultivation in several directions and reduces hand work to the minimum.

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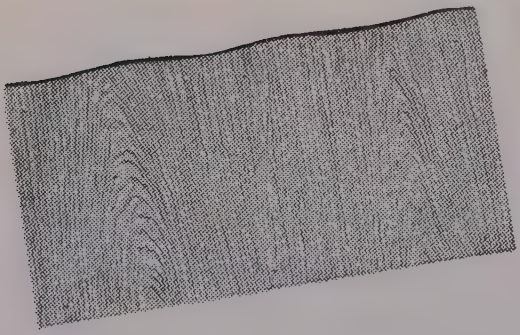

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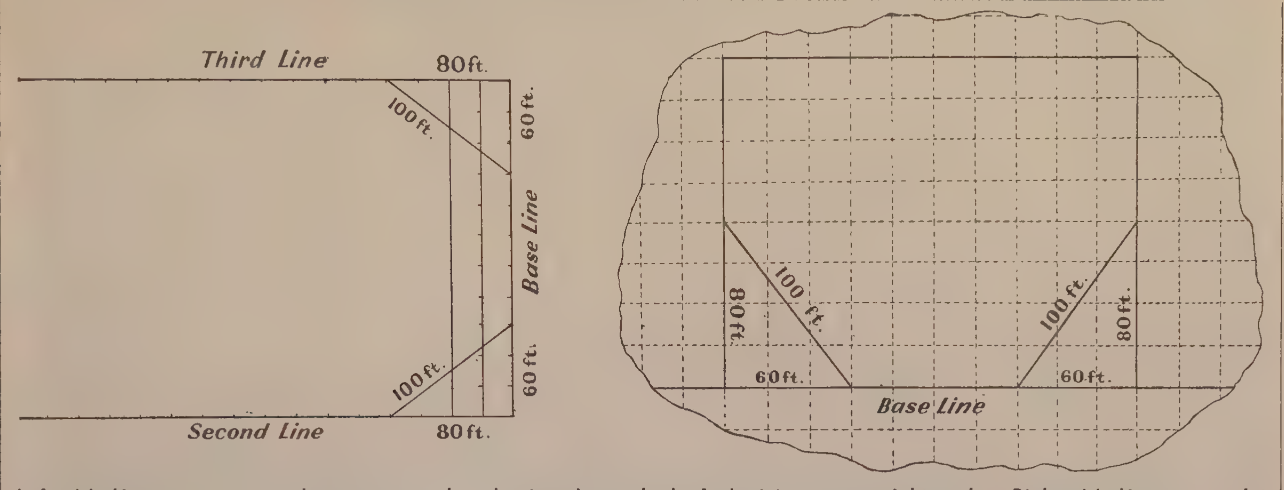


Left—Marking out a rectangular or square plot, showing the method of obtaining a true right-angle. Right—Marking out a plot of irregular shape. The irregular areas are pegged out by prolonging the lines from the rectangular plot by marking wire.

wet places, will suffer greatly if planted so early that their roots are in sodden ground for any length of time before new growth begins.

A planting board will help in the correct placing of trees. A piece of 6in. x 1in. timber, it is about 4ft. long. A V is cut in each end and a deep notch cut about 3½in. into the centre. Before the hole for planting is dug the centre notch is placed round the marking stake and two pegs are driven firmly one in each end V. The board is then removed and the hole dug. The end pegs can be left in position and all the holes may be dug before planting begins.

When the trees are ready to plant they should be laid out in position according to variety as planned, care being taken not to lay out too many trees at a time, because the roots will suffer if exposed to hot sun or wind for too long. The planting board is placed in position against the end pegs and the tree is fitted into the centre notch. It should be planted at the same depth as it was in the nursery. This can easily be ascertained from the soil marks on it. Trees should not be planted any deeper, as, if the junction of stock and scion is below the ground, the scion may root, thus losing the advantages of a good stock. The roots are best placed on a small mound so that they are pointing slightly downward; good topsoil is then thrown over the roots and the tree moved slightly up and down a few times to settle this soil in firmly round the roots. More soil is put in and then the heel is used to firm the soil thoroughly.

If the soil is in good condition for planting, it is almost impossible to plant too firmly.

[*Sparrow*

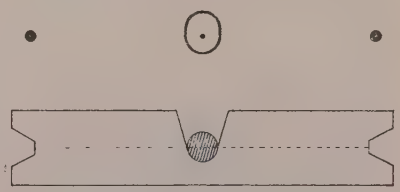
Good cover crops assist soil fertility. This crop of blue lupins in a young Auckland orchard is ready to be disced in.

The sides of the hole are then broken up with a spade, so that the tree will not be sitting in a waterhole, and more good topsoil is thrown round the root area, which should be well firmed with the top 2in. left loose and slightly mounded above the surrounding soil. Once again care should be taken to avoid mounding above the junction of stock and scion.

Fertiliser may be unnecessary on a good, rich soil, but if the soil is poor, about ½lb. of a good orchard mixture may be spread in the bottom of the hole and on the topsoil to be used when planting, and mixed well into the soil before planting begins.

Pruning

When planting has been completed it is essential to prune all trees. The ability of the roots to feed the tree has been impaired by the transplanting and pruning, so the top must be pruned to counterbalance this. Also the young tree is probably unbalanced or has branched too high. A good rule is to prune back to about 18in. above the ground. This may mean the complete removal of all branches, leaving only a bare rod. The buds below will break away and produce a well-balanced tree on a short, firm trunk. If the branches already formed are between 12in. to 18in. from the ground, the three best that are well spaced round the main stem should be selected and cut back to about 6in. All other growths should be completely removed. It hurts many people to carry out this seemingly drastic treatment, which is the only way to build a well-balanced tree on a firm foundation.



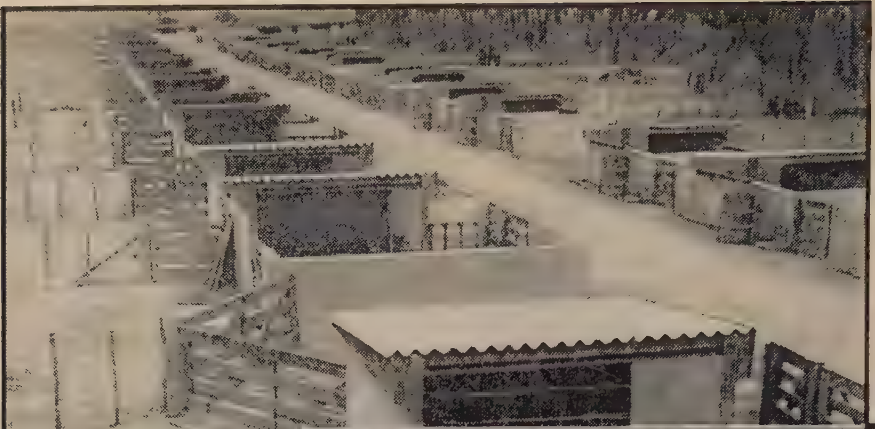
A planting board.

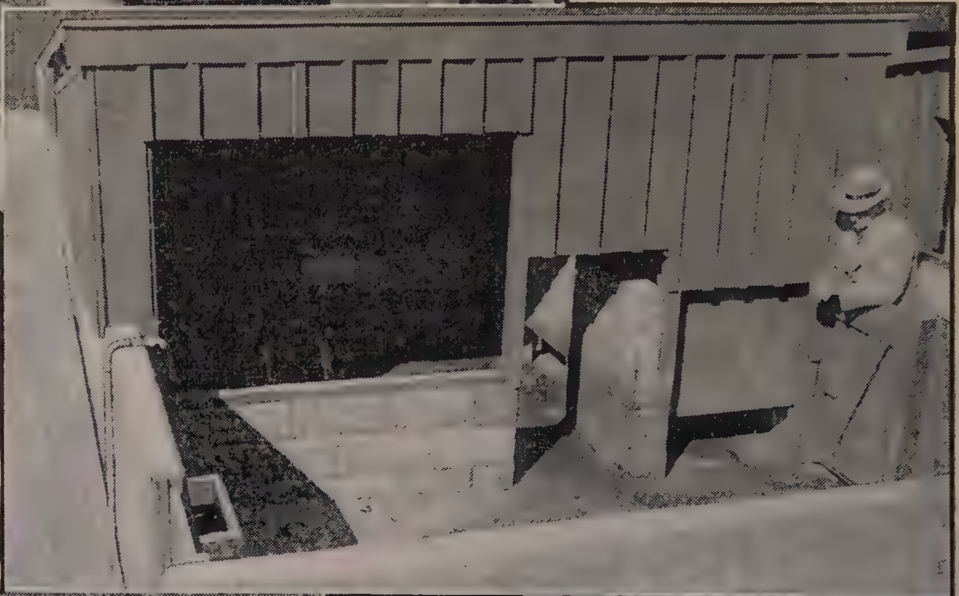
Rabbits and Hares

Rabbits and hares will frequently kill or seriously damage young trees by stripping off the bark. A coil of wire netting may be cut up and bent to form protective circles, or hessian may be fastened round three stakes placed about a foot from the tree. The hessian will also protect the young tree from cold winds. Various brands of rabbit repellants are available, but do not always meet with the success claimed. Mixtures such as sulphonated oil, colloidal sulphur and hydrated lime, and bitter aloes and soft soap have all been used with varying success.

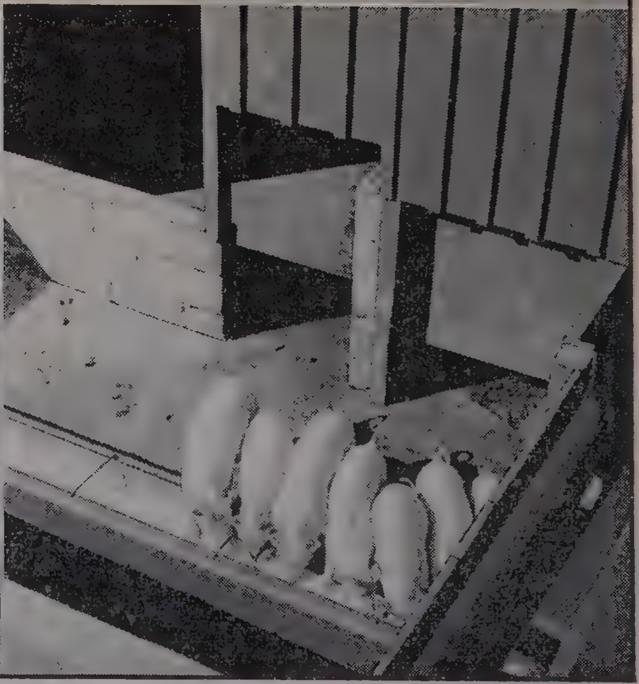
LAYOUT FOR GENERAL PURPOSE HOUSES

Left—Houses of the simple general purpose type with side areas used as creeps while the sows and litters are in the houses and as dunging races later. Below—The covered creep version, the front of which can be closed completely except for the entrance to the sleeping quarters.

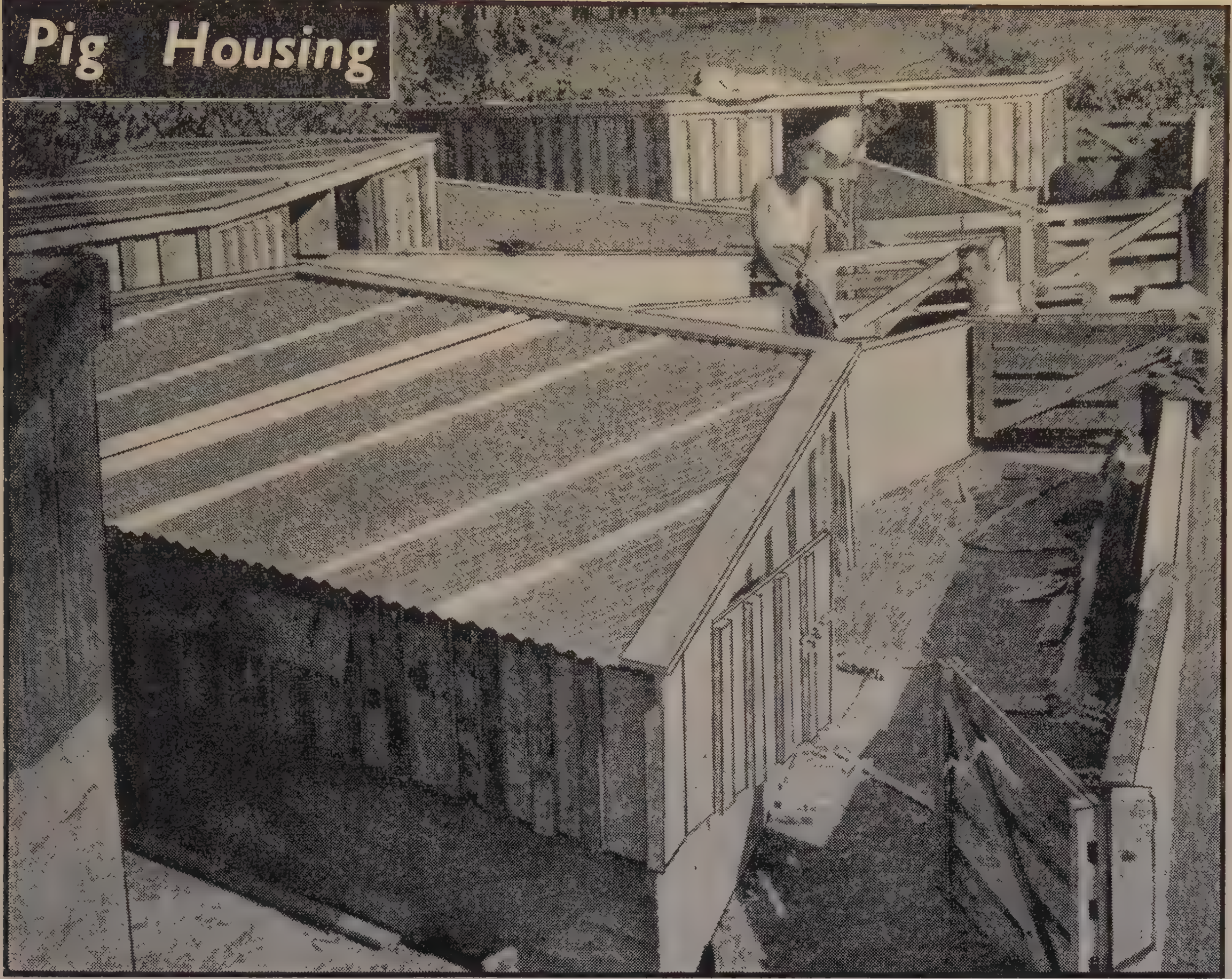




Below left—The milk trough for the creep, where permanent, and the main feed trough should project through the wall for ease in feeding. Note the door into the creep area through which meal can be fed and piglets handled for castrating, etc. Below right—After being weaned the pigs feed from the main trough.



Pig Housing



General Purpose Housing

IN this the third of a series of articles on pig housing A. Longwill, Superintendent, Pig Industry, Department of Agriculture, Wellington, deals with a number of designs which are especially suited to the needs of the average dairy farmer producing pigs on a relatively small scale and wishing to use the same house for farrowing and rearing and fattening of the litters. The importance of appreciation of the underlying principles of the design and the application of the appropriate management methods is stressed.

THERE are four main phases of pig husbandry for which specific features in house design should be provided. These are:—

Farrowing: The house must be designed to enable as many as possible of the pigs born alive to survive over the critical period immediately after farrowing. The inclusion of a brooder supplying artificial heat for the baby pigs is an essential feature of such a design.

Creep feeding: The piglets must be encouraged to take food independently of the sow at as early an age as possible. The essential feature here is an easily accessible creep area, preferably roofed over so that the troughs, which must be kept constantly cleaned and refilled, are not filled with rainwater and the piglets go to the creep freely in all weathers. The sides of creep troughs should not be more than 3in. high so that the small pigs can reach their feed easily.

Weaning: Weaning is one of the critical phases in a pig's life when it is important that it does not receive a check. Provided the piglet has made a good start through creep feeding, there should be little reason for a check. In cold weather weaners frequently fail to keep their sleeping quarters clean. This can be traced usually to excessive floor and air space, which it is quite impossible for small pigs to keep warm. Troughs should have low sides so that the weaners can drink without having to scramble into the trough. Artificial heat may be justified in some circumstances to maintain a temperature in the vicinity of 70 degrees F.

Fattening: A sleeping floor area of about 6 sq. ft. per pig is desirable where baconers are being produced and 4½ to 5 sq. ft. for porkers. The roof should be kept down to 4ft. to 5ft. above the sleeping quarters and well insulated so that the pigs can maintain an air temperature of approximately 60 degrees F. Since most fattening in New Zealand is done in the warmer months, when day temperatures frequently exceed this desired optimum by 20 degrees F. or more, the importance of being able to cool the air in fattening houses must be emphasised; 1ft. of trough space with a capacity of 2 gallons per pig is required for baconers. The fall of the floor should be ½in. to the foot away from the trough to a dunging area situated at the lowest part of the unit.

Specialised or General Purpose?

This brief outline is sufficient to indicate that under large-scale production with continuous, fairly uniform throughput it might be preferable

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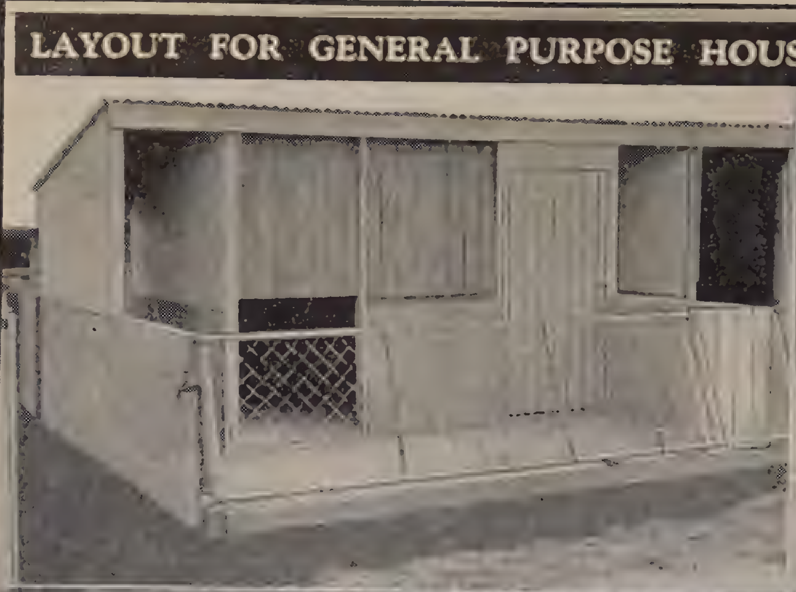
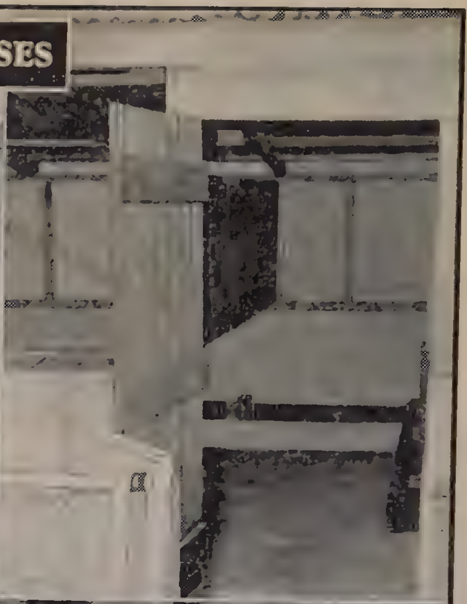
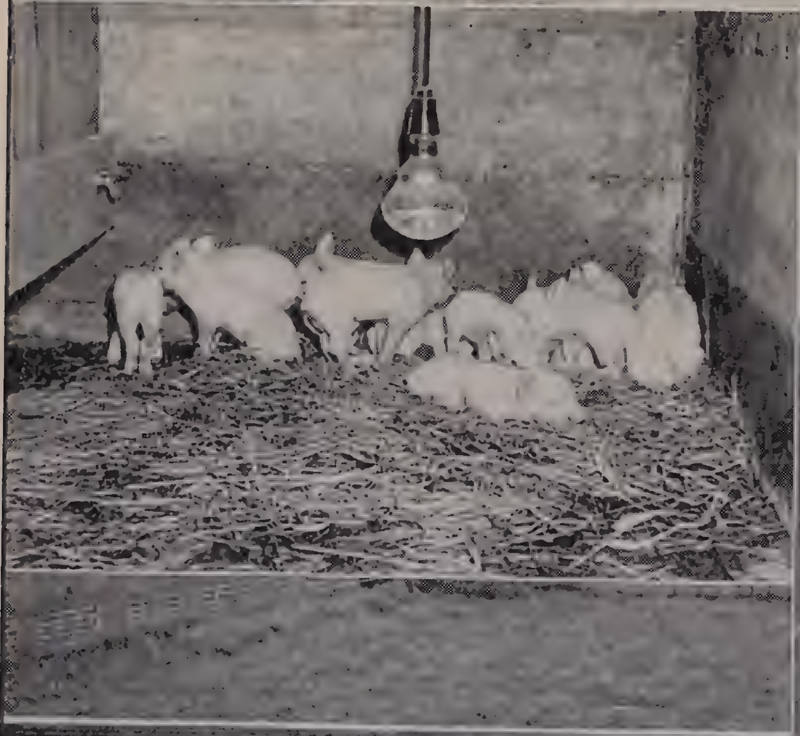
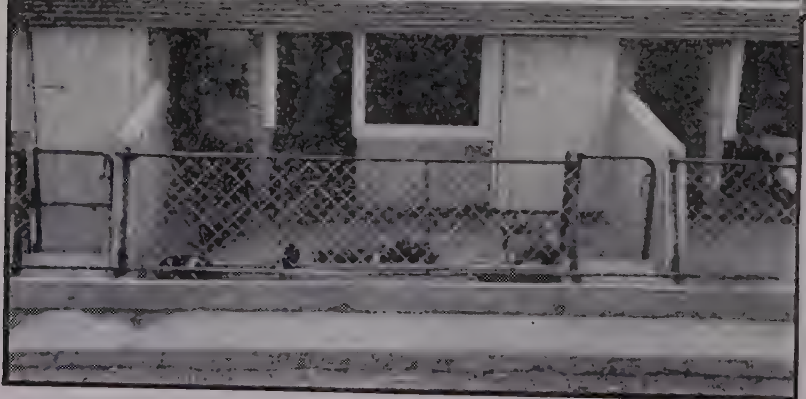
HEADING PHOTOGRAPH: A general purpose layout on a fan principle from the feeding centre, which contains not only the milk container but holding yards, weighing race, etc. The low roofs are hinged at the back and can be raised from the front to give ventilation.

LAYOUT FOR GENERAL PURPOSE HOUSES









Upper left—Side-by-side layout of general purpose house with trough along front and drainage to back. Upper right—The creep partition is fastened up out of the way until the pigs are ready to use the creep. Middle left—If no farrowing rail is employed, the creep area may be used as a brooder and an infra-red lamp employed to provide extra warmth. Middle right—The creep partition lowered and piglets started on meal and milk in separate troughs. Lower left—Revised version of the design at upper left. Wall heights are reduced to 4ft. 6in. at back and 6ft. in front.

to aim for specialised designs which would meet the requirements of each phase of production as fully as possible.

However, even in overseas countries where throughput is much more uniform than it is in New Zealand there is a tendency to avoid too frequent changes of pens in the belief that it takes time for the pigs to adjust themselves to a new home and that in the process of such changes growth is checked. In New Zealand, where the production unit is generally small and throughput seasonal, there is a strong tendency toward the building of general purpose houses. Such specialisation as exists distinguishes between farrowing houses or, more accurately, sow and litter houses and fattening houses. Even the most specialised of the latter group are sometimes employed as general purpose houses, but they will be dealt with in a later article in this series.

On the typical New Zealand pig production unit based on a home breeding policy the first approach to the efficient housing of the pigs is the provision of two or three units of a type suitable for housing sows at farrowing and litters after weaning until they attain marketable weight as porkers or baconers.

Types of General Purpose House

The 8ft. x 8ft. wooden house mounted on runners which was commonly used in the Waikato open-air type of layout or its equivalent on a permanent base but without a proper drainage system or enclosed control yard has come into disfavour because it does not permit effective control over the stock and drainage and therefore it is difficult to maintain grass runs in good condition.

Recommendations today must be for a type of house which, though retaining a desirable restriction of air space and saving of materials, is arranged in a layout to give full control over the pigs and permit proper disposal of drainage. Additional features which are considered desirable and to which attention is given in the designs referred to later in this article are:—

A well-insulated roof.

Some form of control over ventilation.

Fall of floor away from trough and sleeping area to a dunging area situated at the lowest part of the pen.

Provision of a protected brooder area in the centre, in one corner, or along one side of the sleeping quarters and installation of a heat lamp in this area.

Provision for a creep, preferably roofed over.

Fitting of removable farrowing rails.

Provided these desirable features are included in the design, there is room for considerable variation in the arrangement of the houses in the layout to suit the individual circumstances. Some of the possible variations in layout design are included in the examples which follow.

Simplest Type

In the simplest form of design the sleeping quarters only are roofed, the outside yard and creep areas being on an attached uncovered concrete yard. One of the early effective layouts built on this principle is shown in the upper illustration on page 326. In this example units are arranged in tandem and feeding into the main troughs and creeps is conveniently carried out from the side of the unit. The creep trough is movable and, after the litter is weaned and creep partition and trough are taken out, this area alongside the roofed 8ft. x 8ft. sleeping quarters is treated as a dunging area. The large main trough has capacity for up to a dozen baconers and, as such, is too large for weaners. A smaller portable trough which can be placed in the feeding area temporarily is a worthwhile aid to efficient management with this layout.

However, in the layout shown inadequate attention was given to insulation of the roof and means of controlling ventilation, with the result that in cold weather the pigs in the house could have very little effect in raising the air temperature in the house to a point approaching the optimum suggested by recent research. There is a reduction in cost through the creep being unroofed, but this saving is not sufficient for an unroofed creep to be favoured in the colder and wetter districts, where the modification shown in the middle illustration on page 326 finds greater favour.

The essentials of the design in both cases are:—

1. A sleeping floor 8ft. x 8ft. of well-insulated construction: A cavity floor such as may be laid in coke breeze with 2½in. diameter mandrels or with hollow blocks, field tiles, etc., is an advantage. The roof should be well insulated and a controllable ventilation opening of approximately 60 sq. in. provided in the back wall below the insulated lining.

2. An area alongside the sleeping floor and the same depth as this 4ft. wide: This is used at various stages in the production process as brooder (in the covered version), creep, and, finally, dunging area.

3. The feeding yard extends the full width of the above two areas and has either an 8ft. trough centrally placed so that pigs can feed from opposite sides (see the lower right illustration on page 326) or a 10ft. trough against the front wall.

4. The houses fit into the layout in tandem and drain toward the gate into the central feeding race just forward of the front line of the house.

5. The front of the house can be almost closed in cold and wet weather. The extent of closing may vary, according to the severity of the climate, from simply hanging a shutter from the front roof bearer to providing a front which can be closed except for a 30in. x 20in. opening.

6. Farrowing rails (preferably detachable) may be fitted and provision should be made for the inclusion of a heat lamp (electric or one of the kerosene burning type).

7. Water is laid on and can be used not only for drinking but for cooling by being sprayed over the concrete in hot weather.

In the enclosed type access to the creep meal trough is provided by a door into the side of the creep area, though milk can be fed from outside (see the lower left illustration on page 326).

Advanced Design

The attempt which is made in the simple designs described to have one area serve both as creep and dunging areas at different stages of the production process is not always successful. Designs aimed to overcome this drawback, without adding too greatly to the cost of the house, have been produced.

One of the early successful designs is that of Mr. C. Brown, Makerua (Manawatu), erected under the supervision of the Wellington District Pig Council (see upper left illustration on the opposite page). In essence the design is based on what is popularly known as the Danish ground plan; the trough is along the front and drainage falls to a dunging race at the back. The sleeping quarters and communicating passage to the dunging passage are roofed, and the feeding yard and dunging area are uncovered.

A brooder-and-creep area is provided on the sleeping floor at the high side, to which access is obtained through the door on the right side of the house (see the upper right illustration on the opposite page). A solid wooden partition which can be fixed in position or swung out of the way enables this area to be used as a brooder area (see the middle left illustration on the opposite page) or creep (see the middle right illustration on the opposite page). In this house the roof has been built higher than necessary and a later design having an over-all height of 4ft. 6in. at the back and 6ft. in front erected at Mr. M. Currie's farm, Ashhurst, is shown in the lower illustration on the opposite page.

Further Modifications

The advanced designs described work satisfactorily in the relatively cold, wet climate of the Manawatu, but progress is still being made and further designs are being put to practical test.

One of these, providing brooder and creep facilities on a 9ft. x 7ft. sleeping floor as in the last-mentioned design, also provides protection over the dunging race, which instead of being along the back of the house is alongside the sleeping floor in the same way as was described for the covered version of the simplest type. The wall between the sleeping quarters and the dunging race is carried up to the roof and the principles of construction affecting warmth and ventilation are as for the earlier design.

Two advantages claimed for the latest modification are:—

1. A full 10ft. milk trough as well as a 1ft. water trough: This is an advantage in a general purpose house as against an 8ft. trough in the two last-named designs, which are really planned as farrowing and rearing houses only.

2. The dunging areas of each pen drain separately to a main drain along the back of the house, thus reducing the risk of disease spread through the dung channel.

Copies of detailed building plans of this latest modification are among plans available from the Publications Section, Department of Agriculture, Wellington, at 5s.

Each additional feature in a design means not only more material but more labour cost for erection. Where

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building is done by contract it is important that the design should be simple so that labour costs do not become excessive. In this respect the last-mentioned design has some advantages over the previous one.

Another modification incorporating a covered creep but leaving the dunging area uncovered is shown in the heading photograph. Here the main objective has been to fit the houses into a centralised type of layout and they are shaped accordingly. Feeding into the main troughs is centralised very close to the milk container. The creep forms a triangle in the rear acute-angle corner of the house and access is provided by a door in the wall. The roof is insulated and kept as low as practicable. Hinged at the rear, it can be lifted at the front to provide ventilation. Plans of various sizes of layout of this type have been produced by the Northland District Pig Council.

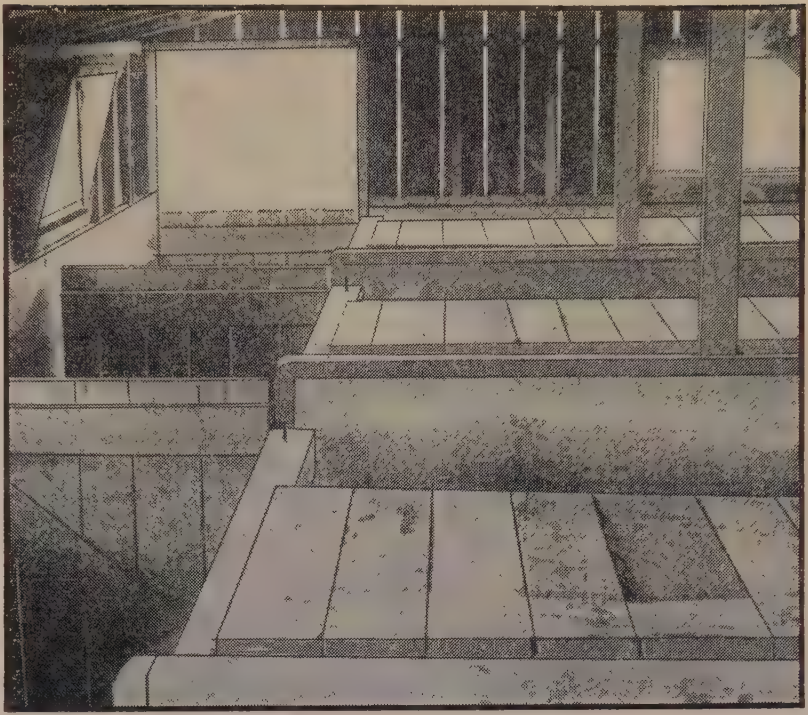
Any centralised type of layout may be difficult to expand unless provision is made for expansion at the outset. When the size of a layout is being decided future needs in relation to disposal of drainage and extra accommodation should be taken into account.

Other General Purpose Houses

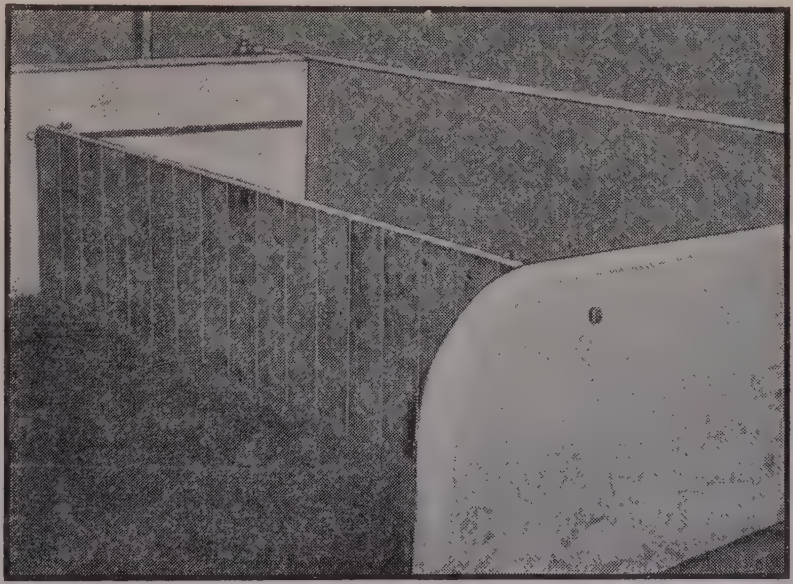
No article on pig housing would be complete without reference to the other types of house which are still in use and which may still have a place under some conditions. Those built with a high roof extending over the whole building from feeding passage to dunging race have the disadvantage that, no matter how well they can be closed up and how effective is the insulation, the air space is excessive and the pigs find it impossible to keep warm in cold weather. This applies particularly to small pigs being wintered and starting off in early spring.

The sleeping quarters of such houses should be covered over with a temporary "kennel" or false roof (see the upper illustration at right) or lengths of timber can be placed over them and bales of hay or straw can be stacked on these. Such hay or straw not only provides a "blanket", but reduces the air space to be warmed. Unless the sides (with the exception of a 20in. wide entrance) are walled up too, however, the house may still be too cold for small pigs.

Small pigs which are cold, as frequently happens after weaning in cold weather, fail to keep their sleeping quarters clean. Some restriction of sleeping floor area is usually advocated in such cases (see the lower illustration at right), but unless it is accompanied by provision of a warm "kennel", the real fault will not have been eliminated. Closing up the ventilation in the totally enclosed type of house, particularly where the fall in the dunging race is very small and urine does not get away quickly, will result in a foul, ammonia-laden atmosphere, and it is better to keep the main building well ventilated and concentrate on keeping the pigs warm on their sleeping area.



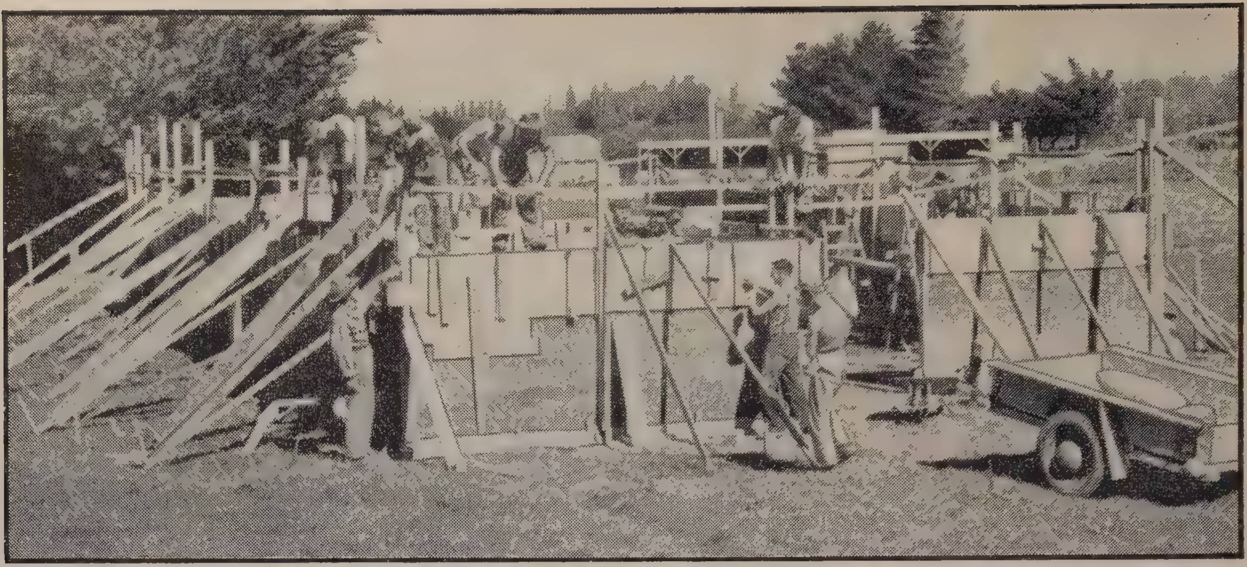
Above—Temporary covers over the sleeping quarters of the high-roofed, uninsulated building based on the Danish ground plan enable pigs to keep themselves warm in cold weather. The boxing-in should be complete except for 20in. x 30in. entrances. Below—Method of reducing sleeping floor space after the litter has been weaned. In addition the restricted area should have a temporary low roof.



Management

It is repeatedly observed that very much better results are obtained by one farmer than by his neighbour, though his facilities are no better. Occasionally the man with poor conditions does better than the man with good ones and this has led some to conclude that housing conditions do not matter very much.

The truth is, of course, that housing and management are both important. Improved design without appreciation of the reasons behind the design and thorough application of the principles underlying it and of general good husbandry will not achieve much. In general purpose housing, which aims to provide for all the phases in production, this is especially important. Intelligent methods rather than expenditure of much time and labour will yield dividends.



Progress of Canterbury Youth Farm Training Scheme

By J. F. MOFFAT, Principal, Rangiora High School

IT is 5 years since the Farm Training Scheme inaugurated by the Canterbury Youth Farm Advisory Council was launched, and the first intake completed its course with the examination for the Farm Workers' Certificate in May 1953. The scheme originated in an endeavour to reverse the country to town drift by enabling town lads who wished to take up farming as a vocation to be assisted in their training.

THE promoters of the scheme realised that farmers would not be enthusiastic about employing town boys who had no knowledge of farming. It was decided that the first essential in the scheme would be to give the lads an introduction to practical farming by spending a year at Rangiora High School. This would enable them to learn agricultural terms and methods, to test their enthusiasm for farming as a vocation, and to get a knowledge of the basic practices of farming. At the end of the first year they could qualify for the Rangiora High School Certificate in Agriculture.

Farm Workers' Certificate

The boys would then go out to work with farmers for the following 3 years, spending 2 years for preference on the first farm to which they were assigned and varying the type of farm visited to broaden their experience. At the end of this period they would present themselves at Canterbury Agricultural College, Lincoln, for a practical examination in agriculture to qualify for the Farm Workers' Certificate. Possession of this certificate it is hoped will indicate a standard of training reached by the holder sufficient to enable him with further experience to manage a farm efficiently and ultimately to own and operate his own farm successfully.

HEADING PHOTOGRAPH: Students under instruction building combined milking shed and indoor feeding stalls at Rangiora High School farm.

Selection of Boys

Boys apply to enter the scheme after 3 or 4 years at a post-primary school and come before the executive for selection. Some have school certificate; some gain it at the end of the year at Rangiora. In the course at Rangiora High School the cadets as holders of technical bursaries worth £40 a year for board must satisfy the educational requirements of the Department of Education. Normal school work in English, geography, agricultural theory, and farm accounting is carried on each morning and the afternoons are devoted to practical work on the school's mixed farm of approximately 140 acres. On Tuesday afternoons experience is gained in woodwork and engineering associated with farming.

The practical farm work covers cropping and general cultivation; dairying for butterfat and pig raising; sheep for fat lamb production and wool, which includes experience in crutching and shearing. The pupils learn to handle farm machinery and all equipment such as milking machines and do the normal maintenance work the average farmer does for himself. That the training received in the first year is sound can be gauged by the reports from the farmers to whom the boys go and by the fact that the demand for the boys exceeds the supply.

Continuation of Training

When the lads go out to farms they are treated by the farmers as cadets and given every assistance in the continuation of their training. Arrangements have been made for the cadets to continue their studies in agriculture, if they wish, by using the courses of the Technical Correspondence School.

The sponsors of the scheme stress the value of saving to the cadets, who are paid generally above the award rate by the farmers for whom they work. This saving enables the youths to take a course or series of special courses at Lincoln College, which the advisory council strongly recommends after the Farm Workers' Certificate has been gained and it enables a start to be made with building up sufficient capital to assist the purchase of a farm later.

In the 5 years that the course has operated 40 boys have been brought in.

One of the first intake, Nathan Hall, gained the New Zealand Young Farmers' Clubs' and Lincoln College Old Boys' Scholarship, which will give him the opportunity of taking the 8 months' short course at Lincoln College this year.

Inception of Scheme

The scheme owes its inception to the enthusiasm of the Christchurch vocational guidance officers, Messrs. M. Keyes, G. Brookes, and G. Innes; to Professor L. McCaskill, Lincoln College, and Mr. M. Montgomery, past and present chairmen of the committee, to Messrs. M. Fleming, V. Wilkinson, and A. M. Carpenter, Federated Farmers, and to the Board of Governors of Rangiora High School. Now the help of the Department of Agriculture is being obtained so that field officers of the Department may keep in touch with the boys in their training and after training periods.

The scheme is a training one only and does not and cannot give a boy a farm. It has enabled town boys to follow their desire for farming and has increased the flow of workers into the farming industry.

Contagious Coryza and Roup in Poultry

By J. J. THOMPSON, formerly Veterinary Research Officer (Poultry), Department of Agriculture, Wellington

CORYZA is a catarrhal inflammation of the lining of the nasal passages commonly referred to as a cold. The first indication of coryza is a watery discharge from the nasal passages. This discharge may in a few days become thickened and purulent, causing blockage of the nostrils and difficulty in breathing. The inflammation may progress still further and invade the sinuses, causing the development of swellings on the face and around the eyes. If the infection spreads to the throat, a thick, cheesy exudate is formed, causing gasping, coughing, and even suffocation in severe cases. At this stage the condition is usually termed roup by the poultry farmer. Roup, however, is a general term covering any disorder giving rise to discharge from the nostrils, swollen face and eyes, and exudate in the throat. Thus it may apply to certain forms of fowl pox, vitamin A deficiency, or chronic pasteurella infection, which show similar appearances.

THE course of contagious coryza varies considerably. Simple colds evidenced by running eyes and nose may occur in the flock and may pass off with little adverse effect, but in other cases coryza leads to a more serious condition sometimes resulting in death. In all cases of colds or coryza there is likely to be a drop in egg production.

Usually a high percentage of the flock is affected, and pullets are particularly susceptible. Older birds act as carriers of the germs, and if allowed to run with pullets even for a short time, can be responsible for an outbreak in the pullet flock.

Cause of Contagious Coryza

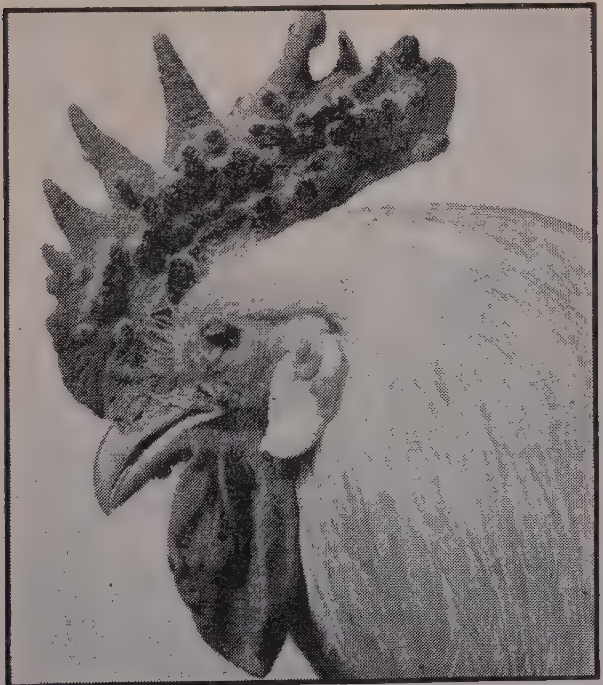
Overseas research work has shown that several types of contagious coryza can be recognised. However, a mixture of both types or complications arising from the presence of secondary invading bacteria may lead to much confusion in attempting to single out the responsible agent in an outbreak of coryza. A germ known as *Hemophilus gallinarum* has been found to be commonly associated with the disease. In New Zealand work has been carried out in an attempt to clarify the causative bacteria in outbreaks in this country, but much has yet to be done before the true picture can be drawn.

Predisposing Causes

Damp litter, overcrowded conditions, draughty houses, poor feeding, and parasites are all causes of an outbreak of coryza. Two particularly common faults frequently observed are overcrowding and lack of good ventilation.

Stuffy, overcrowded houses are often responsible for bad outbreaks of coryza. As much ventilation as possible should be arranged to allow entry of fresh air, though care should be taken to see that there is no direct draught on the birds while they are perching at night. Even in range houses with open sides outbreaks of coryza can occur if overcrowding of birds gives rise to stuffy conditions at night.

Vitamin A exercises a protective function over the mucous membrane and lining of the respiratory passages, and deficiency leads to a lowered resistance to infection with coryza germs. Fresh, young green feed should be in constant supply, and most poultry farmers now feed a vitamin A supplement such as fish oils as an additional safeguard.



When birds are infected with colds it is desirable to watch for nodules on the comb and yellow, cheesy growths in the mouth, as colds may be the forerunner of fowl pox, a very infectious disease, a bad case of which is shown above.

Recognition of Coryza

The first signs of colds or coryza in the flock are a general listless appearance of a number of birds and occasional sneezing or sniffling in the pen accompanied by a drop in egg production. The best method of checking the presence of these symptoms is by entering the house quietly at night when the birds are on the perches. As the disease advances birds suffer from discharge at the nostrils and watery eyes, and in the final stages the disease is evidenced by a severe respiratory condition accompanied by loss of appetite and condition, depression, and sometimes a considerable number of deaths.

Treatment

In the early stages the mild form of coryza may respond to a little extra care in management. If the birds' food consumption drops, changing to wet mash usually stimulates the appetite. The food should be given as separate feeds instead of being continuously in front of the birds. Green feed, milk powder, or milk products are useful foods in helping to keep up condition and preventing loss of appetite. Increasing the supply of fish oil, which is rich in vitamin A, for a short period is a useful measure also.

Local treatment is sometimes helpful in relieving the congestion of the air passages. Some relief may be obtained by spraying the birds lightly at perching time with oil of eucalyptus in liquid paraffin.

The use of antiseptics in the water is of doubtful value, since the birds may cut down their water consumption. Some antiseptics upset the digestion and lead to a further drop in food consumption. Keeping the water vessels clean and changing the water frequently is probably the better method.

Some forms of coryza show excellent response to the administration of sulphathiazole at the rate of 1 : 200 in the feed or sulphamethazine in the drinking water at the same dosage as advised for coccidiosis. The drug should be given for 3 or 4 days and repeated if necessary after an interval of 3 days.

The severe type of coryza, which leads to swellings of the face, inflammation of the sinus passages, loss of egg production, and sometimes heavy mortality, must be dealt with in a more drastic fashion. Badly affected birds should be culled and disposed of by burning or burial in quicklime in a deep pit. The survivors should be carefully nursed and their management and feeding carefully examined to correct any faults. The measures described for the maintenance of appetite and building up resistance are of special importance.

As with many other diseases, early recognition of the symptoms and immediate measures taken to deal with them are often a deciding factor in cutting short the course of the condition and reducing the severity of the losses.

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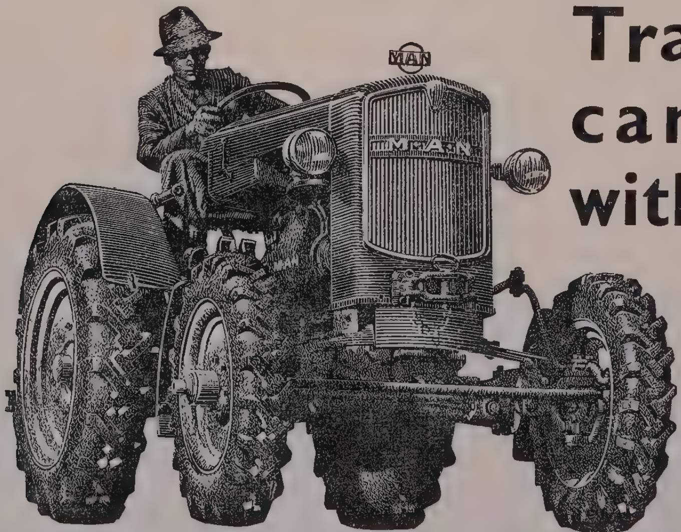

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Nursery Tree Wrenching Implement

By N. J. HIAM, Horticultural Inspector, Department of Agriculture, Auckland

THE digging of nursery trees is a job which must be completed during a fairly short period. If evergreen trees are wrenched some time before they are removed from the nursery, the foliage will harden and the trees will be better able to withstand the effects of transplanting and change of environment. Weather and soil conditions often make hand digging difficult and unpleasant, and very often the nurseryman finds that he is running behind time with the job. To facilitate and lighten digging an Avondale (Auckland) nurseryman, Mr. P. Soljan, has designed an implement which has proved very successful.

ANY wrenching implement drawn by a tractor which travels over the trees, especially tall trees such as citrus, is not advisable, as invariably the trees are damaged. To overcome this a system was evolved whereby the digger is drawn by wire cables extending the length of the nursery rows. The unit is powered by a stationary tractor. Tyre rims are bolted to the rear wheels of the tractor. Cables wind on these rims when the rear wheels are supported clear of the ground and the tractor acts as a winch.

The implement is a simple, sledge-like arrangement consisting of two angle iron skids connected by a curved blade which passes under the rows of nursery trees.

Blades of varying widths can be fitted to suit the type and kind of trees. The blade used was made of ¼in. mild steel plate. The one shown in the diagrams, 23in. wide and cutting 12in. deep, was found to be suitable for pip fruit, stone fruit, and citrus trees. It was also used for grape vines, but a smaller blade would be better for them. Even with smaller plants such as hedgings this system is an advantage, as the soil is not packed or cut up by the tractor wheels. Also the roots are cut cleaner and to a more even length than when the spade is used, and this makes balling or packing easier.

Rows up to 250ft. long were dug with the machine, and longer rows could be dug provided the drums on which the cable winds were large enough.

Two methods of operating the machine were employed. The one found the more satisfactory is that with the tractor set up at right angles to the nursery rows (Fig. 2). The chain on which the rear snatch blocks are hooked is anchored close to the ground to a suitable hedge tree or post. Up to 10 rows can be dug without the tractor being moved. By employing this method it is possible to operate where the headland is narrow, whereas with the system described in Fig. 4 the width of the headland has to be equal to the length of the tractor plus at least 9ft. A further disadvantage is that the tractor must be moved and jacked up for each row.

Operation

The digger is transported to the far end of the nursery row (two men

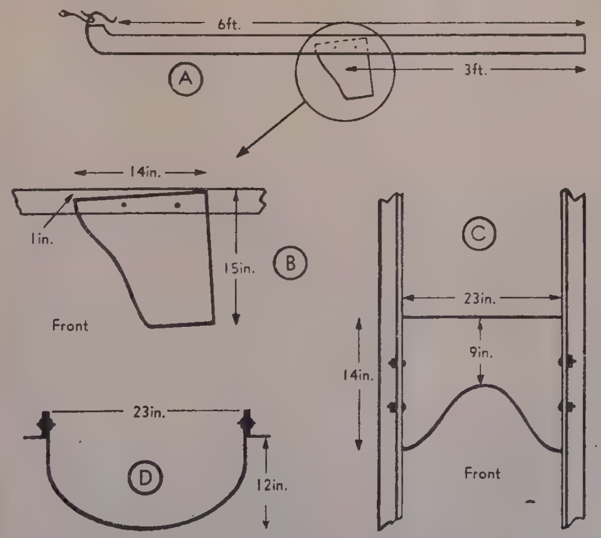


Fig. 1—The digger: A—Side view. B—The blade set 1in. off square to set the cutting edge at a slight angle. C—Top view. D—End view.

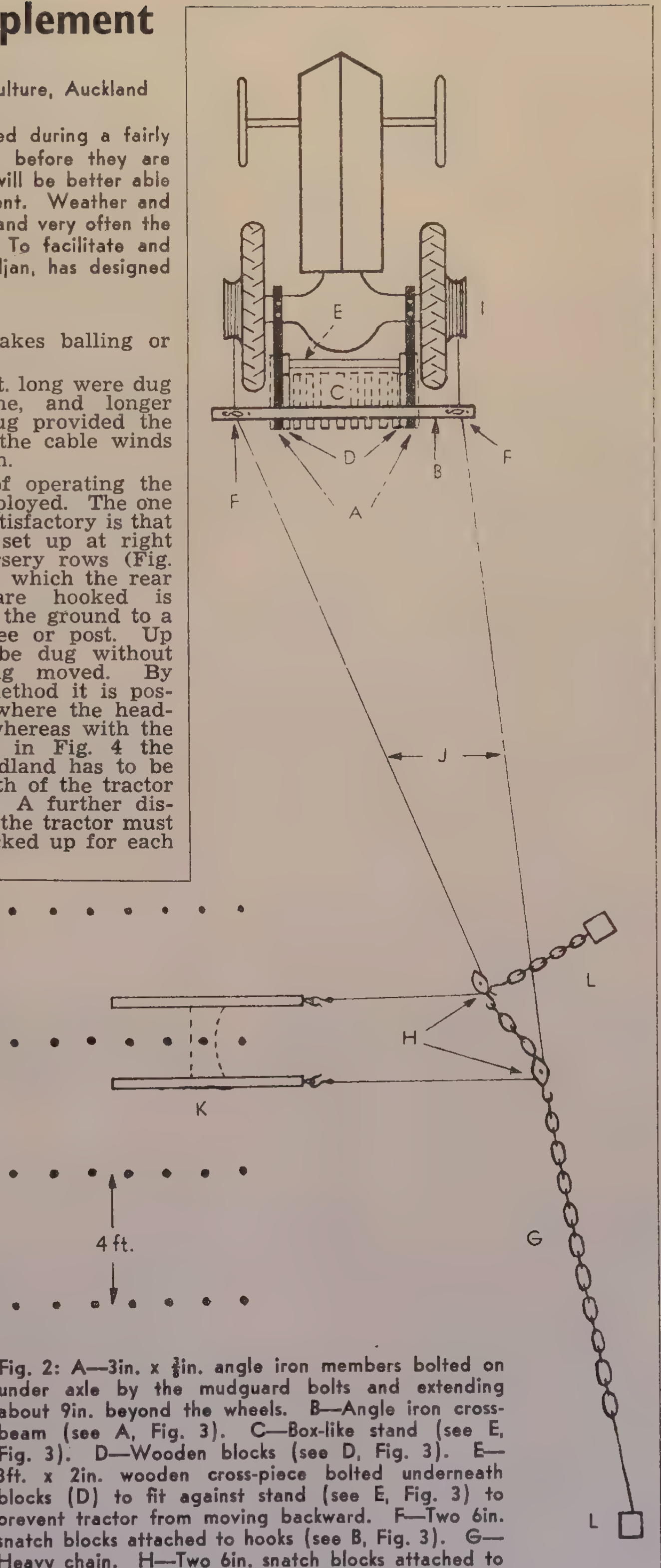


Fig. 2: A—3in. x ⅜in. angle iron members bolted on under axle by the mudguard bolts and extending about 9in. beyond the wheels. B—Angle iron cross-beam (see A, Fig. 3). C—Box-like stand (see E, Fig. 3). D—Wooden blocks (see D, Fig. 3). E—3ft. x 2in. wooden cross-piece bolted underneath blocks (D) to fit against stand (see E, Fig. 3) to prevent tractor from moving backward. F—Two 6in. snatch blocks attached to hooks (see B, Fig. 3). G—Heavy chain. H—Two 6in. snatch blocks attached to chain. I—Two 16in. tyre rims bolted to wheels. J—5/16in. cable. K—The digger. L—Posts or trees to which chains are attached.

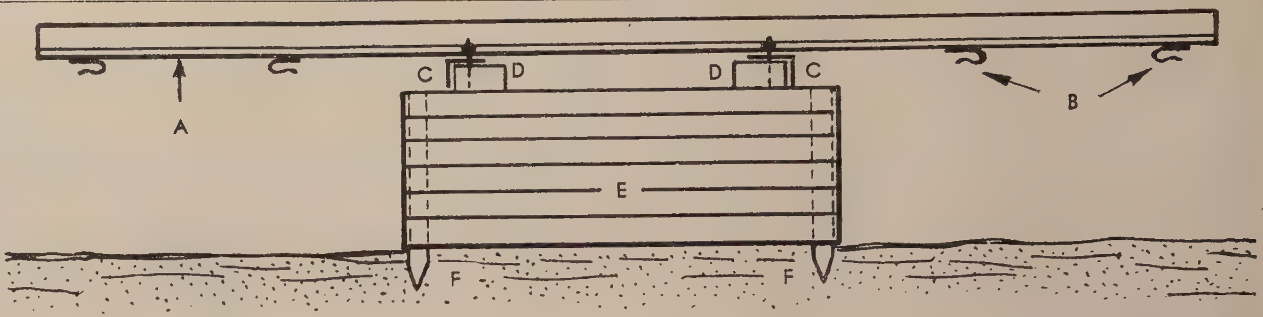
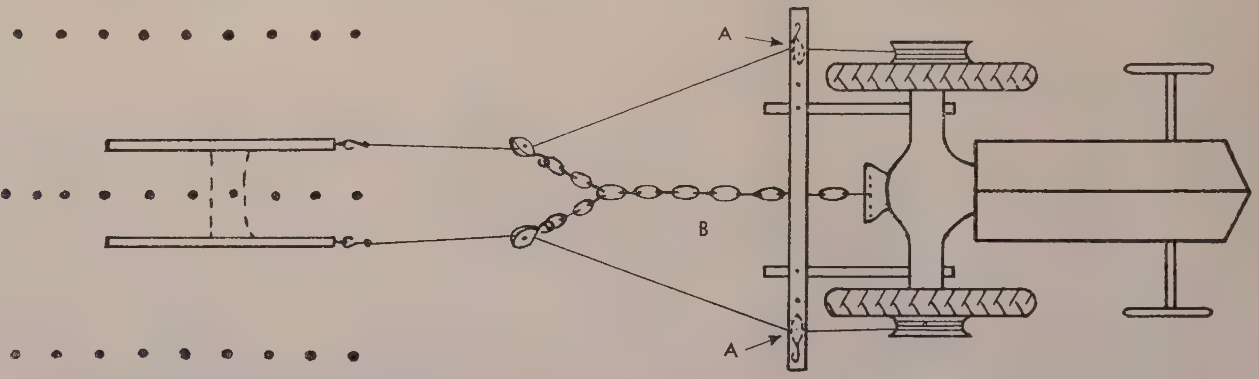


Fig. 3 (above)—Rear view of tractor attachment: A—3in. x $\frac{3}{8}$in. angle iron beam; its length will depend on the width of tractor. B—Four hooks welded to angle iron bar. The hooks must be set so that the snatch blocks are in line with the cable drum. When the direct pull is employed the blocks are attached to the outside hooks. If the right-angle pull is employed as in Fig. 2 with the nursery trees to the left of the tractor, the left-hand hook is used on both sides. Similarly, if the tractor is set up with the trees to the right, the right-hand hook on either side is used. C—Angle iron members (see A, Fig. 2). D—Wooden blocks 6in. x 3in. by about 1ft. 3in. bolted on to cross-beam to cushion the weight of the tractor on the stand. E—Strong wooden stand on which the tractor rests. F—Legs of box pointed to prevent skid. Fig. 4 (below)—Tractor set up in line with rows: A—The snatch blocks are both attached to outer hooks on the cross-beam. B—Chain about 6ft. long to which rear snatch blocks are attached. Except in Fig. 1 measurements are not given, as these will depend on the size of the tractor used.



can carry it). If three men are operating, both cables are then run out together—one man to each cable and the third operating the tractor, which is run in reverse gear. If only two men are available, one cable is taken at a time with the tractor operator locking the opposite side wheel with the brake. The pulling operation is done with the tractor in second or top gear and with the motor running at idling speed. The tractor differential acts as an equaliser and keeps both cables at an even tension.

Acknowledgment

Assistance given by Mr. Soljan in making available the particulars given in this article is acknowledged.

CHANGES OF ADDRESS OF "JOURNAL" SUBSCRIBERS

To ensure continuity of delivery of issues of "The New Zealand Journal of Agriculture", subscribers are required to give 4 weeks' notice of change of address. The old address (preferably an address label clipped from a recent "Journal" wrapper) and the new address should be sent to the nearest office of the Department of Agriculture.

Book Review

"Farming Records and Accounts": J. Wyllie

IT is only of recent years that the majority of farmers have kept more than rudimentary accounts and records of their farming operations. Even today most farm accounts probably do not go beyond the minimum necessary to compute the annual return to the Commissioner of Inland Revenue. There are, however, many signs of an awakening interest in the keeping of farm records as a basis for improved management.

For that reason the book "Farming Records and Accounts" by James Wyllie, of Wye Agricultural College, will be of considerable interest. Though it is naturally written round English conditions and thus has only limited application in detail to New Zealand, there is no reason why the general principles laid down should not be followed in this country. This applies particularly to the records and accounts described in Part I.

Cost accounting as it can be applied to agriculture is described in Part II with timely warnings of its problems and limitations when used for this purpose. Part III of the book deals with efficiency standards, and here again the author wisely stresses the necessity for careful definition of an efficiency standard with due regard to factors of input as well as output.

In general this is hardly a book for the average farmer, but it should be of value to those engaged in advising or assisting farmers in management and accounting problems, particularly that small but ever-widening group of public accountants who are endeavouring to build up a service for the farmer which goes deeper than the preparation of income tax returns.

The book, which is exceptionally well furnished with specimens of record sheets and accounts, is published by Butterworth Scientific Publications and is priced at 41s.

—*J.V.W.*

Publications Received

"Farmer and Stock-breeder Year Book 1954", Farmer and Stock-breeder Publications Ltd., Dorset House, Stamford St., London. Price in Great Britain 10s. 6d. (postage 6d.).

"Success with Cloches", Alan G. Merfield. A. H. and A. W. Reed, Wellington. Cheap edition 7s. 6d., bound edition 12s. 6d.

ILLUSTRATIONS: In Westland inland valleys are drained and coastal flats dissected by fast-flowing creeks and rivers such as the Ahaura. V. C. Browne photo. The map shown was prepared by the Department of Education.

Improvement of Ploughable Pastures in Westland

By J. R. SHEPHERD, Fields Instructor, Department of Agriculture, Greymouth

THE West Coast of the South Island, because of its climate, is generally unsuitable for other than grassland farming, and dairying, beef production, and sheep farming are the chief farming industries. Most of the farmed country is on river flats and open flood plains which were previously covered with bush and scrub. After early farming the fertility dropped, resulting in swards of low-fertility species with a fair percentage of rushes and weeds. This did not unduly perturb the land owners, as further areas were readily available for stock to range over, thus to a certain extent compensating for the drop in production from existing pastures. Only in recent years have the full effects of this sward deterioration been felt.

MOST pastures were dominated by browntop, with *Lotus major* plentiful and giving valuable feed. Yorkshire fog and white clover were also present. Though some pastures had been topdressed some years before, and some trials were laid down in 1920, it was not until 1930 that the Department of Agriculture inaugurated a systematic plan of topdressing experiments in various parts of the district. In these experiments lime, phosphate, potash, and nitrogen were used, nitrogen being omitted in later trials.

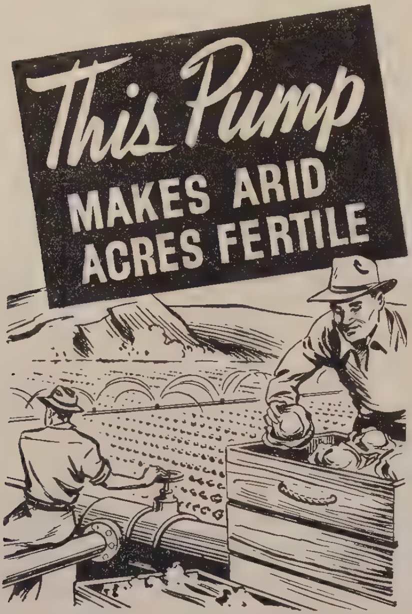
The feature of these trials was the marked response to lime and also to superphosphate where lime had been previously applied. Responses from potash were rare. Farmers showed considerable interest in these topdressing trials, with the result that the use of lime and phosphate on existing pastures increased. The effect of this topdressing was an increased clover content of the sward, a better and stronger growth of grass, and a marked improvement in the palatability of the herbage. In many cases there was also suppression of sweet vernal, rushes, and weeds.

Though the programme of topdressing with lime and phosphate slowly expanded and results were quite good, it became apparent that the existing pasture species were not capable of full response to the fertilisers applied. Pasture species capable of higher and longer seasonal production than browntop and Yorkshire fog were needed. Unfortunately in the attempt to establish such high-producing pastures many disappointments were experienced, due mainly to lack of knowledge on the part of the farmers concerned. Quite commonly virgin land was turned over and the ploughing, seldom well carried out because of the nature of the country, was followed by one or two cuts with discs and the area then sown down, a typical mixture being:—

	lb. per acre
Perennial ryegrass	20
Italian ryegrass	5
Timothy	4
Dogstail	2
Red clover	2
Alsike clover	2
White clover	1
	36

Management was usually not good and areas of young grass were pugged by being grazed by heavy cattle under wet conditions. This, together with poor establishment and unsatisfactory drainage, resulted in the ryegrasses and clovers being replaced by browntop and Yorkshire fog within 2 years. Timothy did not establish because it was smothered or grazed out when young. Some mixtures included cocksfoot, meadow fescue, and meadow foxtail, and these species also failed for the same reasons. The result was that the areas rapidly deteriorated to low-producing species with, in many cases, dense areas of rushes. A prejudice was thus often created against ploughing up and resowing to pasture.

In recent years pasture improvement and management have been taken more seriously and the haphazard methods of the past discarded in favour of a more definite and ordered routine. Research work has



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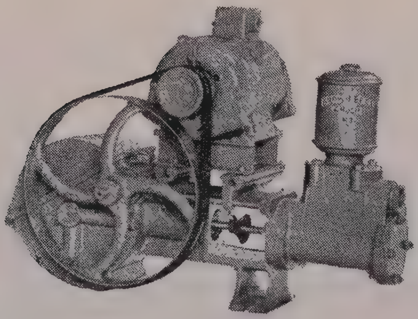

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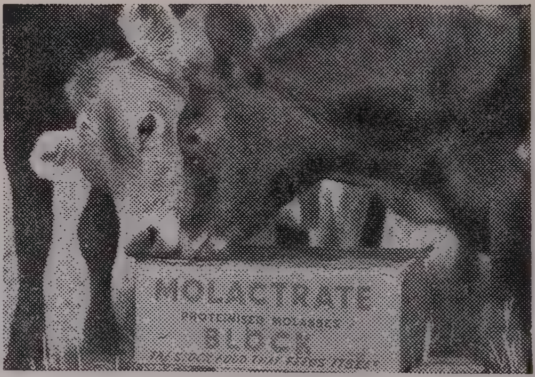

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shown that first-class pastures of high-producing species can be economically established on soil types ranging from the alluvial soils of the river flats to the light loams of the terraces.

Successful early weed control in pastures depends on adequate cultivation to obtain consolidation, together with sowing the seed at a heavy rate and at a time when germination and growth will be rapid. Cultivation practices vary according to the type of land. Where stones or timber are abundant surface working has to be carried out. On the deeper soils the plough can be used. Whichever method is used, at least one forage crop, but preferably two, should be grown between ploughing up the old sward and resowing to pasture.

Drainage

Drainage is a problem on most properties, excessive soil moisture in winter being a limiting factor in grazing management. Winter poaching ruins many promising pastures and allows the ingress of weeds and rushes. Apart from pakihi areas, great improvements in drainage can be effected by tile, timber, stone, or mole drains, either singly or in combination. It must be stressed that where drainage is not satisfactory high-producing pastures cannot be established or maintained.

Cultivation

Cultivation, if properly carried out, assists in the aeration and drainage of the soil, and brings about a fine, firm tilth in the topsoil which allows rapid germination of the seed sown. If cultivation is inadequate, thin uneven strikes of seed will result.

Cultivation for First Crops

For cultivation for first crops ploughing should be 6 to 8in. deep, as flat and clean a furrow as possible being turned to bury all old turf.

The furrow should be rolled along its length to ensure consolidation and to promote the decomposition of the turned-under turf. This area is then left to fallow and consolidate for as long as possible. Subsequent working down depends on soil type and the crop to be sown. For the alluvial soils and lighter loams alternate tine harrowing and rolling are sufficient for most crops. Clay soils and the heavier loams require one or two light cuts with the discs before tine harrowing and rolling. Where there is buried timber or where the soil is shallow top-working must be resorted to and as good a seed-bed as possible obtained with discs or bush and bog discs followed by harrowing and rolling.

Turnips are the best first forage crops, particularly for new ground that has been difficult to work. Swedes, however, are satisfactory on good land. In some areas willow weed and redshank are serious weeds and may smother a root crop. A good method of controlling these weeds is to broadcast the turnips fairly thickly, at from 12 to 14oz. per acre, together with a bushel of lupins. Such a heavy seeding tends to smother the weeds. Greenfeed is the next best first crop and in this category come the cereals, lupins and Italian ryegrass, and red clover. Of these oats are the most popular because they provide a good, quick-growing smother crop for weedy areas. Whichever crop is used it should be fed off with the objective of ensuring the maximum return of animal excreta to the area.

Cultivation for Subsequent Crops

Cultivation for subsequent crops is similar to the first working, the only difference being that the plough is set 1½ to 2in. shallower so that buried, undecayed turf is not disturbed. If possible the previous furrows should be crossed, but should the area be ploughed the same way again, all the strike-outs should be in the previous finishes. The tine harrows and the roller are then used to leave a well-compacted, fine, and firm seed-bed.

Second crops: After feeding off of the root crop area has been completed by early spring it is recommended that a second forage crop be grown until the area is made ready for sowing down to new pasture in the next autumn. Forage crops recommended for this part of the rotation are oats and tares, lupins, red clover and Italian ryegrass, or barley and tares. In seasons when this second forage crop is not needed for forage it can be cut for silage.

After the second crop the area is sown down to pasture in the next autumn.

Fertilisers and Lime

Lime and phosphate are necessary in this district. Rates of application vary somewhat, but for newly turned ground lime should be applied at from 10cwt. to 1 ton per acre and superphosphate at from 2 to 3cwt. per acre. Applications at these rates should be repeated for the second forage crop and for the sowing down to pasture.

Time of Sowing down Pastures

Time of sowing down pastures varies according to local conditions, but over the years autumn sowing has proved to be better than spring sowing, due largely to there being less competition from weeds in autumn sowing. In districts subject to severe early frosts spring sowing must sometimes be attempted, but sowing must be early enough to allow the pasture to become well established before hot, dry weather sets in.

Left—Badly run-out pasture at Westport capable of vast improvement. Right—A good-quality pasture at Westport. Dominantly white clover and ryegrass, it was established by good cultivation and adequate fertilising.

Pasture Seed Mixtures

The pasture seed mixture to be sown is determined by the proposed utilisation of the paddock. For general use on dairy farms the following mixture is recommended for permanent pastures:—

	lb. per acre
Certified perennial ryegrass	20
Certified short-rotation ryegrass	10
Crested dogstail	1
Certified white clover	3
Certified Montgomery red clover	3
	37

Cocksfoot and timothy are not included, as experience has shown that, except on the light soils, these species seldom establish satisfactorily. If sheep are used for the initial grazings, and provided control recommendations are carried out as close to the ideal as possible, these species could be included to form the following mixture:—

	lb. per acre
Certified perennial ryegrass	15
Certified short-rotation ryegrass	8
Certified cocksfoot	4
Certified timothy	4
Crested dogstail	1
Certified white clover ..	3
Certified Montgomery red clover	2
	37

Cocksfoot and timothy do not endure sheep grazing better than cattle grazing, but in the early life of a young pasture proper control by sheep (heavy concentration for a short time) assists in preventing them from being smothered by the faster-growing species, thus assisting their establishment to a degree not obtainable under their grazing by cattle.

Crested dogstail is included in both mixtures because it is such a vigorous species in the district and because it produces an appreciable amount of early feed. The first grazing the paddock receives is extremely important. A quick, light grazing is desirable, sheep being ideal for this purpose. Stocking at a heavy concentration for a short time gives a nice, even trim, whereas a light stocking for a longer period results in patchy grazing and uneven control of pasture growth.

The first winter is one of the most critical stages in the life of young pastures, as growth has practically ceased in the older pastures on the farm, and when a farmer is short of winter feed there is a great temptation to graze the young pastures heavily. In wet conditions cows tend to pug the pastures very badly, and it is preferable to use young dairy stock and to graze young pastures rotationally with the aid of the electric fence. Every endeavour should be made to avoid pugging, as it damages both the turf and the soil structure, but as some light poaching will occur in spite of every care, the roller should be used as soon as possible afterwards to level up the poached areas. A further disadvantage of heavy winter grazing is that it weakens the ryegrass and results in a clover-dominant sward, which may possibly cause bloat in the spring.

Control of Young Pastures in Spring

Should it be necessary to use a first-year paddock for the production of winter feed, cutting early for silage will not damage the pasture as much as cutting it for hay. The recovery of grass and clover after cutting for silage is good, and a valuable autumn aftermath is provided. However, the system that damages the young pasture least is to top with the mower set at about 4in. high. This gives excellent control of pasture and, provided the cut material is not too bulky, stock will generally clean it up eagerly.

Pasture improvement by laying down to new pastures after cropping may be termed the long-range method and it is obvious that it will take years to get around the farm. In the meantime the older pastures cannot be neglected and to effect some improvement the short-range policy can be applied. This consists of topdressing these older and poorer pastures with lime and phosphate, and if the sward is deficient in clovers, clover seed can be oversown with the fertiliser after a tripod or tine harrowing. Oversowing with grass seed is generally not satisfactory unless the area has been well harrowed to provide some loose surface soil to cover the seed.

Worthwhile increases in production can be achieved only by ploughing up run-out pastures and resowing with selected strains of high-producing grasses and clovers. Improvement of the old pastures composed of low-producing pasture species cannot result in the high production of which the land is undoubtedly capable.

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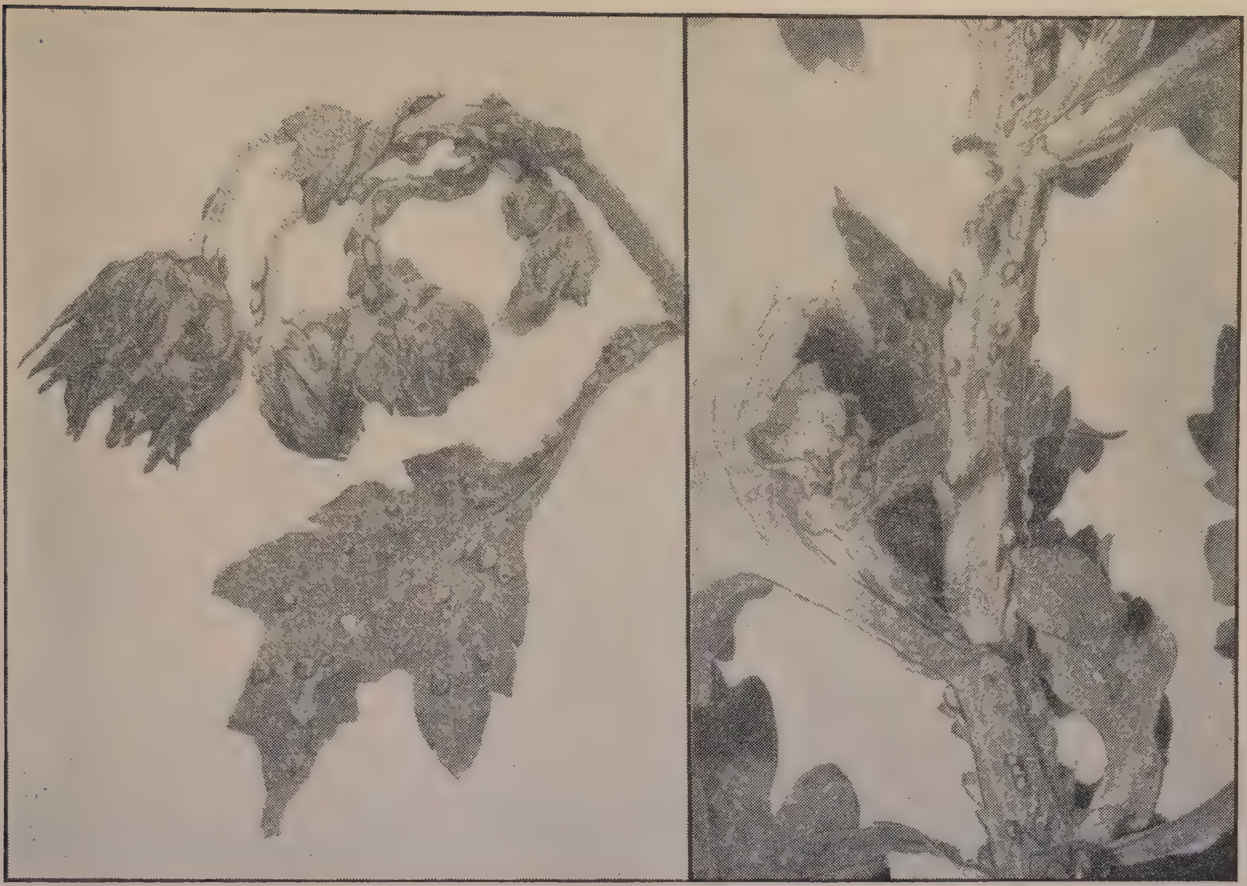
Meteorological Records for February

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	69.0	+ 3.4	86.5	51.1	4.33	13	+ 0.16	1.98	27	168.1
Auckland	160	70.0	+ 3.3	84.9	56.4	3.26	8	— 0.65	1.69	28	180.8
Tauranga	10	68.2	+ 3.2	86.6	50.7	0.94	5	— 2.79	0.37	28	196.5
Ruakura	131	66.0	+ 2.7	83.7	40.6	0.96	7	— 2.12	0.53	3	169.8
Rotorua	975	65.2	+ 2.3	85.1	42.6	2.45	11	— 1.30	0.91	21	166.2
Gisborne	12	67.6	+ 2.5	86.8	45.0	0.95	8	— 2.10	0.31	25	185.1
New Plymouth ..	160	64.7	+ 2.2	75.8	50.0	2.81	8	— 1.17	1.00	2	155.4
Karioi	2125	62.0	+ 4.4	81.0	35.1	1.18	9	— 2.87	0.36	20	
Napier	5	68.8	+ 3.4	89.0	49.4	0.51	7	— 2.17	0.23	7	188.0
Wanganui	72	67.4	+ 3.7	83.8	53.4	0.80	8	— 2.17	0.25	27	167.4
Palmerston North .	110	66.4	+ 3.9	82.6	45.0	0.91	9	— 2.18	0.21	2	148.8
Waingawa	340					0.57	9	— 2.24	0.14	20	170.8
Wellington	415	63.2	+ 1.9	76.7	51.0	2.00	9	— 1.28	0.64	1	173.1
Nelson airfield ..	5	63.3	+ 2.1	82.1	45.4	2.71	4	+ 0.09	1.75	2	192.5
Blenheim	12	64.9	+ 2.1	82.9	45.1	1.05	5	— 1.09	0.50	2	205.1
Hokitika	15	59.8	+ 1.7	71.1	44.5	16.09	18	+ 8.36	3.35	1	130.1
Hanmer	1270	63.0	+ 3.6	89.5	39.0	1.29	9	— 2.36	0.37	15	176.4
Christchurch ..	22	65.2	+ 4.4	95.3	48.3	1.24	6	— 0.56	0.51	15	189.3
Ashburton	323	64.0	+ 3.0	92.5	44.2	1.49	7	— 1.20	0.72	2	141.1
Timaru	56	63.7	+ 3.5	95.7	44.8	1.88	8	— 0.34	1.04	2	130.9
Alexandra	520	64.1	+ 2.7	88.7	39.1	1.27	9	— 0.20	0.43	2	192.2
Taieri	80	61.5	+ 3.8	90.9	36.9	1.07	12	— 1.24	0.35	2	151.1
Invercargill airfield	0	57.6	+ 1.4	83.1	35.4	3.27	17	— 0.08	0.56	6	165.2



The Chrysanthemum Gall Midge: A Newly Recorded Pest

By K. P. LAMB, Plant Diseases Division, Department of Scientific and Industrial Research, Auckland

SOME heavily galled chrysanthemum plants were sent in April 1953 to the laboratory of the Plant Diseases Division of the Department of Scientific and Industrial Research in Auckland for examination. Adult insects reared from these plants were identified as the chrysanthemum gall midge (*Diarthronomyia chrysanthemi* Ahlberg). This is a serious pest of cultivated chrysanthemums in some overseas countries, but has not hitherto been recorded in New Zealand.

THOUGH H. F. Barnes (1948) records the occurrence of this midge in the U.S.A., Canada, England, Northern Ireland, Scotland, Denmark, Sweden, Finland, Germany, Switzerland, the Channel Islands, and possibly France, this appears to be the first record for the Southern Hemisphere. Infested plants were found in several home gardens and in one commercial garden in Auckland.

The most obvious sign of infestation is the presence of oval or conical galls about 1/10in. long on the stems, leaves, or buds of chrysanthemum plants (see illustrations above). The galls are often somewhat lighter in colour than the surrounding tissue and at maturity may be tinged with red. A single larva feeds and pupates inside each gall. The adult midge emerges from one end of the gall, usually leaving the delicate, transparent pupal case protruding from the exit hole. The adult insect is a delicate fly 1/16 to 1/12in. long The female, with its red, swollen abdomen is readily, distinguished from the male, which is slender and greyish brown. Adults emerge early in the morning, when considerable numbers may be found clinging to leaves of infested plants. Mating and egg laying take place soon after emergence. The adults live for only a few hours and few are alive the day after emergence. The bright, orange-red eggs are laid in the buds or in leaf folds, particularly on new growth. The length of the incubation period has been found by overseas workers to vary between 3 and 16 days, depending on temperature and humidity. Newly hatched larvae bore into the leaf and are soon completely surrounded by gall tissue. The length of the immature period in New Zealand is unknown, but development from egg to adult probably takes 1 to 3 months, depending on the season.

Though the chrysanthemum gall midge is regarded overseas primarily as a glasshouse pest, some very heavy infestations have been seen outdoors in Auckland. This suggests that the insect could become a serious pest to commercial chrysanthemum growers in the mild Auckland climate. In severe infestations leaves are badly distorted and stems and buds are malformed. Infested flower buds may fail to open or flowers may be stunted and distorted. This species of midge is practically confined to the commercial chrysanthemum. Barnes (1939) while investigating its host range found that it would also breed successfully on *Chrysanthemum indicum* L., *C. rubellum* Sealy (*erubescens* Hort.), *C. indicum* L. var. *azaleoides* (*azaleanum* Hort.) and chrysanthemum Korean Apollo.

HEADING PHOTOGRAPHS: The most obvious sign of infestation by the chrysanthemum gall midge is the presence of oval or conical galls about 1/10in. long on the stems, leaves, or buds of the plants. The galls are often somewhat lighter in colour than the surrounding tissue and at maturity may be tinged with red. Department of Scientific and Industrial Research photos.

The inaccessibility of larvae and pupae within the leaf tissue renders control difficult. The time of emergence from the galls is the most vulnerable period and repeated spraying or fumigation is usually recommended at this time. The adults may be killed by cyanide fumigation or by spraying with nicotine sulphate (1 part in 800 parts of water) and soft soap. Recent work with sprays containing lauryl thiocyanate (1 : 600 or 1 : 400) has shown this substance to be highly effective in killing the eggs. This spray will also kill a high proportion of the larvae within the galls. At a concentration of 1 part in 800 parts of water it has also been used as a dip for cuttings before planting. Sprays must be applied thoroughly every 4 days for effective results.

Summary

Barnes (1948) summarised the chemical and cultural practices required for midge control as follows:—

"1. All plants not required for propagating should be destroyed immediately after flowering. It is preferable to assemble the stock plants in one house if possible.

"2. Regular twice-a-week spraying of these plants should be started 4 or 5 weeks before it is expected to begin taking cuttings. While spraying it should be remembered to attempt to reach and wet both surfaces of the leaves.

"3. Before starting the spraying all the tips of the new growth should be removed and destroyed. Later, all above ground growth can be cut away with advantage.

"4. Cuttings should be taken only from subsequent new growth. While this is appearing the spraying should be continued as before.

"5. All cuttings should be dipped and thoroughly wetted in the spray solution before planting.

"6. They should be removed immediately for rooting into a glasshouse or frame in which there have not been any chrysanthemums for at least 14 days.

"7. As soon as the required cuttings have been taken the old stools should be destroyed. Care should be taken to destroy all plant remains, especially the leaves, which are liable to be blown away into corners and overlooked. The burning of large quantities of stools is often difficult, but burying them at a depth of at least 1 to 1½ft. has been recommended as an alternative. Care should be taken to consolidate the soil on top of such stools.

"8. It is inadvisable to spray the cuttings, as this is liable to cause damage."

Where infestation with this insect is suspected it would be of material assistance if growers would inform local officers of the Horticulture Division of the Department of Agriculture.

References

"Some Gall Midges and Their Host Plant Range", "The Annals of Applied Biology", vol. 26, pp. 318-347, H. F. Barnes (1939).

"Gall Midges of Economic Importance", "Gall Midges of Ornamental Plants and Shrubs", vol. 4, H. F. Barnes (1948).

Prevention of Onion Mildew

By H. JACKS, Plant Diseases Division, Department of Scientific and Industrial Research, Auckland, and T. C. R. DAWE, formerly Horticultural Instructor, Department of Agriculture, Pukekohe

IN the Pukekohe district downy mildew, caused by the fungus *Peronospora destructor* (Berk.) Casp., is of major importance in seedling beds and seeded field crops of onions. Onion seedling beds are sown in the district from late March onward, and as the rainfall and soil temperatures at that time of the year are generally high, conditions are suitable for development of the disease. In some instances the stands in seedling beds have been seriously reduced and the surviving plants found to be unsuitable for transplanting. Seeded field crops are put in during July, August, or September, and though these are not affected to the same degree as seedling beds, it was found that in some crops mildew reduced yield by almost 25 per cent.

TESTS were carried out at Pukekohe on seedling beds as well as on transplanted onions. Fungicides used (concentrations are given at rates used in 100 gallons of water) were Bordeaux mixture 6 : 8 (6lb. of copper sulphate and 8lb. of hydrated lime), cuprous oxide (50 per cent. copper) at 5lb., copper oxychloride (50 per cent. copper) at 5lb., "Phygon XL" (50 per cent. dichloro naphthoquinone) at 1lb., and "Ialine" colloidal copper (15 per cent. copper) at 20lb. To ensure better distribution of spray and its adhesion to onion foliage a commercial spreader-sticker called "Peps" (polyethylene polysulphide latex) at 0.5lb. or summer oil at 0.5 gallon was used.

Volume of Spray

The volume of spray varied with the size of plants. In general, crops 1 month old were sprayed at 30 gallons per acre, those 2 months to 3 months old with 60 gallons, and those 4 months to 5 months old with 100 gallons per acre.

Seed-beds were sprayed at 10-day intervals from mid-May, when plants were 5in. to 6in. high, to early August, when seedlings were planted out in the field. Transplanted onions were sprayed from early September to mid-January (3 weeks before harvest). Applications to transplanted onions were made at intervals of either 10 days or 20 days. Seeded field crops were sprayed at 10-day intervals from August, when plants were 4in. to 6in. high, until they were 10in. high, after which applications were made at 14- to 20-day intervals.

Results

On Seed-beds

"Phygon XL" with summer oil caused severe stunting of seedlings on seed-beds. The most effective treatments were copper oxychloride with "Peps", copper oxychloride with summer oil, and Bordeaux mixture with summer oil.

On Field Crops

Copper oxychloride with "Peps", Bordeaux mixture with summer oil or with "Peps", cuprous oxide with summer oil or with "Peps", "Phygon XL" with "Peps", and "Ialine" colloidal copper with "Peps" gave highly significant increase in plant weight. There was no significant difference in the efficiency between treatments applied at 10- and 20-day intervals.

Recommendations

Copper oxychloride at 5lb. in 100 gallons plus 0.5lb. of a commercial spreader-sticker or Bordeaux mixture 6 : 8 : 100 plus 0.5 gallon of summer oil are recommended for control of onion mildew.

It is necessary to begin applications to seed-beds when seedlings are 4in. to 6in. high and to spray at 10-day intervals until seedlings are ready for transplanting. Field crops should be sprayed at 14- to 20-day intervals from the early seedling stage to 3 weeks before harvest.

Beside "Peps" another commercial spreader-sticker is available under the name of "YF 3198".

Acknowledgment

The authors thank Mr. M. McDougall, of Pukekohe, for providing the area and facilities for the trials.

Book Review

"Soils and Agriculture of Awatere, Kaikoura, and Part of Marlborough County": H. S. Gibbs and J. P. Beggs

THIS is the latest soil bulletin (Soil Bureau Bulletin 9) published by the Soil Bureau of the Department of Scientific and Industrial Research.

After describing the area covered by the soil survey Gibbs deals briefly with the geology and the climate of the district and gives a good summary on soil formation. The classification of soils in the area is covered and each soil type is described and problems in their utilisation are dealt with. This section in conjunction with the soil map included in the bulletin can be of considerable use to those who contemplate purchasing land in this part of the Marlborough Land District and also to established farmers in the area.

A table giving detailed results of the chemical analysis of the various soil types is included and the bulletin concludes with a description of the farming systems in the district, this section being contributed by J. P. Beggs, Instructor in Agriculture, Department of Agriculture, Blenheim.

—*R.H.S.*

Paper cover 8s. Quarter cloth 10s. 6d. Government Printer, Wellington.

Control of Rushes in the Auckland Province

RUSHES infest many thousands of acres of varying types of country throughout Auckland Province. They are almost always a problem on badly drained soils, but are not confined to these. This article by J. E. Bell, Fields Superintendent, Department of Agriculture, Auckland, describes trials which have been carried out with hormone weedkillers on rushes in the province.

THE spraying of the ethyl ester of 2,4-D on rushes cut at least 2 months previously may at times give a complete kill at the rate tried of 2lb. of acid equivalent per acre. Often the rushes recover after a considerable setback. If advantage is taken of this setback, rush control may be achieved by good pasture management, which should in any case be adopted in rush-infested country. The soft rush (*Juncus effusus*), more readily eaten by stock, is more easily killed by spraying with hormones than the hard and more wiry *Juncus polyanthemos*. Experimental work is continuing in an endeavour to find out more about the possibilities of rush control with hormone weedkillers. More information is required concerning the relationship of time of cutting and time of application to the effectiveness of the treatment.

Rushes dislike mowing and grazing by stock and will not then easily withstand strong grass and clover competition. They extend outward by short underground stems or rhizomes and these can extend and enlarge the plant fairly easily where there is an open sward or where the pasture is kept closely grazed. To combat rushes it is therefore necessary to establish a vigorous growing sward which is permitted to grow.

Cattle assist in controlling rushes because they can deal better than sheep with the desirable fairly long pasture and will eat much of the regrowth after cutting. Because of the resultant cutting and smothering, haying of fields also lessens the amount of rushes in a pasture. The softer, less wiry stemmed species is more palatable and cattle readily eat the regrowth of soft rush after cutting. As most rushes prefer moist conditions, cutting after midsummer is usually considered more effective than at other times. Cutting, however, should be persisted with to obtain the best and most speedy results.

In certain conditions it may be more economical to keep land wet and to grow water grasses than to drain it and establish perennial ryegrass-white clover pastures. Under flooding conditions rushes can be eliminated by the vigorous growth of suitable species such as *Glyceria maxima* (*Poa aquatica*), *Phalaris arundinacea*, and *Paspalum distichum*. If it is considered desirable to drain the land and make it suitable for all-year-round grazing and the growth of pasture species such as ryegrass and white clover, rushes will be eliminated only if the fertility of the soil is maintained at a level at which these pasture species grow vigorously.

Control by Hormones

The use of hormones on rushes aims at a faster and easier way of eradicating rushes than periodical cutting. To obtain permanent results and assist the hormones in doing their work it would appear necessary to follow the principles of pasture management outlined. Trials with hormones were begun in late 1949 after reports on successes in Ireland with the sodium salt of M.C.P. One trial was laid down on a dry peat soil, one mainly on a meadow soil which was rather wet in winter, and the third on a wet sandy soil with an ironstone pan. On the peat soil sodium salts of M.C.P. and 2,4-D and the ethyl ester of 2,4-D were sprayed in December on uncut rushes and on regrowth rushes which had been mown several months previously. The species treated was *Juncus polyanthemos*. The rushes were completely killed where the ethyl ester of 2,4-D was sprayed at 2lb. of acid equivalent per acre on regrowth rushes. Poorer results were secured with lower rates and with the other materials and much poorer results on uncut rushes. In the trial on *Juncus polyanthemos* on a meadow soil the sodium salt of M.C.P. and ethyl ester of 2,4-D were sprayed in December on uncut rushes, rushes cut some months previously (regrowth rushes), and rushes cut just before spraying of the hormones. Though the regrowth rushes suffered somewhat, none was killed, but the ethyl ester of 2,4-D gave better results than the sodium salt of M.C.P. In the third trial both the sodium salts of 2,4-D and M.C.P. were ineffective when sprayed in January on uncut rushes. The cut rushes were affected, but recovered later. The rushes in all three trials were hard rushes.

In the summer of 1950-51 five trials were laid down. Four were on wet

Left—A large, erect-growing strain of *Juncus polyanthemos*, which is probably the most common rush in New Zealand and of which there are many strains. Below—Because its stem is soft and easily broken, *Juncus effusus* is frequently kept grazed down hard by stock.

Juncus vaginatus, a hard-stemmed species, is the only rush with a hollow stem in New Zealand pastures.

alluvial or meadow soil and the fifth was on a wet sandy soil with a pan. One trial showed a complete kill with the ethyl ester of 2,4-D at 2lb. of acid equivalent per acre on the soft rush *Juncus effusus* cut in the previous September, but it was not effective against the hard, wiry *Juncus polyanthemos.* The sodium salt of 2,4-D at the same rate gave almost a complete kill of the soft rush, and the butoxy ethanol ester of 2,4,5-T was ineffective. In the same trial rushes cut 2 weeks before spraying were not affected. In three other trials in which the same treatments were used on thickly rush infested, very moist, and badly drained country both *Juncus polyanthemos* and *Juncus effusus* cut some months previously were destroyed by 2lb. of the ethyl ester of 2,4-D. They were unaffected by the sodium salt of 2,4-D and recovered after being slightly affected by 2,4,5-T. In the fifth trial, on the wet sandy soil, neither the esters of 2,4,5-T nor the mixed esters of 2,4-D and 2,4,5-T were finally effective. The latter gave the better preliminary results.

So far it appeared that the ethyl ester of 2,4-D at 2lb. of acid equivalent per acre, the highest rate tried of this material, was the most effective preparation, that cutting was necessary to get good results and should take place some months before treatment, and that the softer rush *Juncus effusus* was more easily killed than the wiry rush *Juncus polyanthemos.*

Superiority of Ethyl Esters

In the 1951-52 season ten trials were laid down, eight in summer and two in May, 1lb. and 2lb. of acid equivalent of 2,4-D and a new formulation, polyethylene glycol ester of 2,4-D being used. It was thought that the latter with its slower killing properties and greater translocation would be more effective. However, the ethyl esters were superior in all trials, showing that the greater penetrating power of ethyl ester was of importance in dealing with rushes.

Of the eight trials laid down in summer on rushes cut some months previously the ethyl ester of 2,4-D was successful in one trial on the hard rush *Juncus polyanthemos*, on another trial on the soft rush *Juncus effusus*, but not on the hard rush *Juncus vaginatus.* The other six trials laid down in summer did not give very satisfactory results.

The ethyl ester of 2,4-D gave a fair measure of control. With all other preparations the rushes were sickened but not entirely killed, recovering in the following spring. Possibly if such results were followed by proper pasture management, good results might still be achieved.

The best results were secured from the higher rate of 2lb. of acid equivalent per acre for all treatments.

Two trials were laid down in May. One gave poor results, but in the other most of the rushes were dying or dead in the following October. May was considered late for hormone applications, as hormones are supposed to be most effective during good growing conditions. In this trial the weather was fairly favourable to growth after treatment.

Trials in 1952-53 Season

Trials in the 1952-53 season gave further conclusive evidence that before spraying is done grazing or cutting is necessary to obtain satisfactory results. It appears that the hormones enter the soft regrowths much more easily than the old hard stems. Probably for that reason the soft-stemmed *Juncus effusus* is more readily killed than the more wiry, hard-stemmed species. Spraying of the rushes immediately or soon after cutting gave the same unsatisfactory results as in the previous trials. It was found necessary to wait until there was a growth of 18in. to 2ft., which can hold the spray. Spraying should not be delayed until this growth becomes hard; otherwise the spray will not penetrate into the plant tissues.

Other formulations were tried and there did not appear to be any advantage in using the butoxy ethanol ester as against the ethyl ester of 2,4-D. The amine salt of 2,4-D was given a try-out in six trials and was found to be about equally effective. It requires further trial.

Rates of application ranged from ½lb. to 3lb. of acid equivalent. In about half of the trials about 100 per cent. kills were obtained from 2lb. of acid equivalent applications. At lower rates the results were generally unsatisfactory. At rates higher than 2lb. results were better than from 2lb. applications on only a third of the trials. It appears that the rate of application should be about 2lb. of acid equivalent.

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Book Review

"The Dominion Laboratory"

THE scope of scientific investigation in New Zealand is very much wider than most people would realise; that is the impression gained from studying the booklet "The Dominion Laboratory", which describes the activities of the oldest laboratory in New Zealand. The Dominion Laboratory, now a branch of the Department of Scientific and Industrial Research, carries out most of the chemical and chemical-engineering work required by various Government departments, it assists local bodies which do not have laboratories, and it gives certain services to industry.

Examination of cement and concrete for hydro-electric dams, of water supplies, of factors affecting meat quality, of materials used as evidence in the Courts, of petroleum products, of paint, coal, and spray materials—these are just a very few of the multiplicity of investigations undertaken by the Dominion Laboratory.

Apart from an outline of what the Dominion Laboratory does, the booklet leaves at least these two impressions: First, the great range of problems in New Zealand requiring scientific investigation; secondly, the wide field which is open to those who qualify in one of the many branches of science.

Copies of the booklet are available from the Director, Dominion Laboratory, P.O. Box 8018, Government Buildings, Wellington.

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Provisional Land Utilisation Survey of North Auckland

"REPORT on the Provisional Land Utilisation Survey of North Auckland", which was published late in 1953 by the Department of Lands and Survey, records on a provisional basis the undeveloped land resources of North Auckland. The aim of these surveys is, in the words of the Minister of Lands in his foreword, "to define and plot worthwhile areas of undeveloped farmable lands, and, if they are of sufficient size to warrant attention, to establish their ownership". The provisional survey is to be followed by a more detailed study in which areas are classified as to suitability for immediate or deferred development and the various factors in their development are taken into account.

IT was natural that North Auckland should be the first region chosen for study, because it is one of the few remaining areas where substantial amounts of new land await development. The survey, however, goes much further than the assessment of areas of virgin land. It covers the total area of the region, including land at present under some form of cultivation.

North Auckland is generally considered to embrace the counties of Mangonui, Whangaroa, Hokianga, Bay of Islands, Whangarei, Hobson, Otamatea, Rodney, and Waitemata and thus extends from Auckland City to North Cape. The region is characterised by a mild climate with generally adequate rainfall and a great diversity of soil types. These include extensive areas of difficult clay gum lands and ironstone soils interspersed with swamps, some alluvial soils, and relatively small patches of good volcanic land. The west coast is characterised by extensive areas of sand dunes. There is some steep land, but mostly the region consists of easy rolling country under the 1000ft. contour. It was the area of the great kauri forests; these were beautiful trees, but they left an unfortunate legacy of acid soils of a texture unbelievably difficult to work into a good tilth.

With appropriate cultivation and the use of lime and phosphate good pastures can be established on a big proportion of North Auckland soils, though in some areas the cost will be high. Thus the potential carrying capacity given in the report may on the basis of present knowledge and present costs tend to be theoretical rather than realistic.

The procedure of the survey was that the first approach should take the form of a provisional survey to ascertain:—

1. Present and potential land use.
2. Underdeveloped and undeveloped land resources.
3. Location of unfarmable land and farmable land.
4. Undeveloped areas suitable for further investigation.
5. Essential data for a comprehensive survey.

On these bases the land has been broadly classified as:—

Unfarmable land, which includes native bush, exotic plantations, steep land, raw sand dunes, swamps not economically drainable, problem and eroded soils, and land which cannot be economically developed for farming or which will go out of production.

Farmable land, comprising flat, rolling, and hilly land capable of being farmed permanently or of being developed for that purpose.

Present and Potential Land Use

The area and utilisation of North Auckland can be summarised as follows: The total area of the region, excluding boroughs and town districts, is 3,790,000 acres. The survey divides this area into unfarmable land, 1,082,000 acres or 28 per cent., and farmable land, 2,708,000 acres or 72 per cent.

An analysis of these areas is as follows:—

	Area acres	Approx. percentage of total
Unfarmable Land		
Native bush, mostly on steep slopes	479,000	13
Exotic plantations	33,000	1
Steep land, not bush clad	190,000	5
Sand dunes	157,000	4
Swamps not economically drainable	23,000	—
Problem and eroded soils ..	97,000	3
Aerodrome and urban expansion areas	33,000	—
Lakes, harbours, tidal inlets, etc.	70,000	2
	1,082,000	28
Farmable Land		
Flat and rolling, ploughable	1,581,000	42
Hilly, not ploughable ..	1,127,000	30
	2,708,000	72

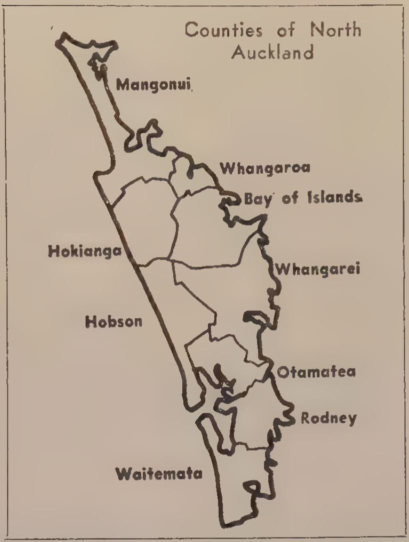
Included in the farmable land are 409,000 acres of low-fertility hill land which may not come into production until the more attractive lands are developed and the bringing in of which, though the report does not expressly say so, will depend on the relationship of prices to costs at some future date. The remaining 2,229,000 acres in the area with which the report is principally concerned can be subdivided as follows:—

	Area acres	Per cent.
Fully developed land in first-class pasture	161,000	7
Mainly undeveloped land selected for further investigation ..	228,000	10
Other farmed land, of which only two-thirds is in grass (mostly poor)	1,910,000	83

It thus appears that there are some 865,000 acres of land still ungrassed (one-third of 1,910,000 plus the 228,000 acres of mainly virgin land).

Potential Stock Carrying Capacity

The potential increase in carrying capacity is put at 200 per cent. of the 1948 level; 1948 has been chosen as a base because the field work was carried out between 1948 and 1950. Between 1948 and 1952 livestock numbers in North Auckland in terms of stock units increased by 16 per cent. Favourable seasons have contributed in part to this increase, but it is also clear that many farmers in the area are wide awake to the potential of their land. Progress in the past has been hindered by lack of finance and the absence of suitable machinery for development work.



The general picture is that North Auckland is a region of considerable potential, possibly the highest of any region in New Zealand. Whether the figure is 200 per cent. above the present level or 150 or 250 is not of great moment. No one can foresee future technical developments which may render even these figures conservative. Before proceeding with the detailed survey by counties the report discusses the main points in achieving this potential.

Opinions may differ on the relative importance of some of these; for example, not all agriculturists may agree that kikuyu should be grouped in the same category with gorse and tall fescue as an undesirable alien. In placing the main emphasis on finance as the most important factor the report is, however, unquestionably on sound lines. There is ample evidence that by and large there is a sincere desire in North Auckland to increase production and that a major limiting factor is the fact that the many farms have not yet reached that stage of development where, even at present high produce prices, there is a reasonably substantial net surplus for reinvestment in farm improvement. One indication of this is the large number of applications from North Auckland which have come before the Marginal Lands Board.

In analysing present and potential land use in North Auckland and indicating the factors which will require attention both by the State and by individual farmers the Department of Lands and Survey has made a significant contribution to knowledge of the district which is today one of the most important in New Zealand because of the large area of land with a high production potential.

"Report on the Provisional Land Utilisation Survey of North Auckland": Department of Lands and Survey, Wellington (Box 8003). 13s.

Care of Livestock during May

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The best feed for calves is good, fresh pasture, and the most satisfactory method of providing this is by rotating the calves through the paddocks ahead of the cows.

Contributed by the Animal Research Division

UNTHRIFTY CALVES

THE best feed for calves is good, fresh pasture, and this can be provided by rotating the calves through the cow paddocks. Good-quality hay is necessary to supplement the sappy young autumn pasture. At the first sign of unthriftiness calves should be drenched with phenothiazine, being given the full dose recommended on the label. Drenching, however, will not be effective unless the calves are properly fed.

BLOOD POISONING IN HOGGETS

Blood poisoning in hoggets grazing on turnips is becoming an increasingly important problem. Deaths occur from infection with the blackleg organism, which probably gains entry through the mouth. An excellent vaccine, which confers very good immunity, is now available for purchase in New Zealand. On properties where losses have previously been experienced, hoggets should be vaccinated a fortnight before they are placed on turnips. The nearest Veterinarian or Livestock Instructor should be consulted concerning the method of vaccination.

AUTUMN-SAVED PASTURE

In most districts there is still time to provide good winter grazing by shutting up paddocks and letting them grow during autumn and early winter. Having some pasture cover on paddocks before the first frosts will assist pasture growth during winter. Autumn-saved pasture is invaluable for early-calving cows. It also provides the best insurance against sleepy sickness in ewes. If necessary, silage should be fed to cows now to enable some paddocks to be shut up. Once the ewes have been tupped they are all the better for being done fairly hard until 3 or 4 weeks before lambing. This also will enable some paddocks to be spelled.

RED WORMS IN HORSES

Red worms can seriously reduce the efficiency of working horses, and are responsible for many deaths in foals. Phenothiazine is a very effective remedy, but is best given under veterinary supervision, as, in certain conditions, it may prove dangerous. Animals should be treated before winter.

PREVENTION OF SUCKING BY CALVES

Sucking of each other by calves is a habit which should be broken as soon as it is detected. The insertion of a bull ring is effective in most cases.

MILKING MACHINE OVERHAUL

As soon as the cows have been dried off arrangements should be made for the milking machine to be overhauled by an expert. Do not install complicated gadgets, but make sure that all parts of the machine are working efficiently. This will not only ensure rapid, trouble-free milking, but is likely to increase production, and will help to reduce mastitis. The Department of Agriculture's Bulletin No. 260, "Mechanical Milking", should be carefully studied by every dairy farmer.

INOCULATION OF DOGS AGAINST DISTEMPER

Distemper in dogs can in a very high percentage of cases be prevented by vaccination. This is best done when the pups are 3 to 4 months old. The virus has a short life, and it is therefore necessary to notify the Veterinarian at least a month before the pups are to be vaccinated.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during February and for the 7 months ended 28 February 1954, with comparative figures for the same month and 7-monthly period of 1952-53, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Tons			Percentage inc. or dec.
	Creamery	Whey	Total	
February 1954	12,141	294	12,435	—
February 1953	16,846	337	17,183	—
Increase or decrease ..	—4,705	—43	—4,748	—27.632
7 months ended 28/2/54	121,930	2,376	124,306	—
7 months ended 28/2/53	132,974	2,418	135,392	—
Increase or decrease ..	—11,044	—42	—11,086	—8.188

Butter in store at 28 February 1954 was 20,234 tons

CHEESE

Period	Tons			Percentage inc. or dec.
	White	Coloured	Total	
February 1954	11,030	36	11,066	—
February 1953	11,320	30	11,350	—
Increase or decrease ..	—290	+6	—284	—2.502
7 months ended 28/2/54	75,981	134	76,115	—
7 months ended 28/2/53	77,261	109	77,370	—
Increase or decrease ..	—1,280	+25	—1,255	—1.622

Cheese in store at 28 February 1954 was 15,615 tons

If these figures are converted into butterfat equivalent, there is a decrease of 6.844 per cent. in butterfat graded for the 7 months as compared with the corresponding period of the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time they are not necessarily a true indication of production trends.

Wheat Production and Pasture Management

Seasonal Notes by the Extension Division

THE provisional estimate by the Government Statistician places the wheat area for 1953-54 at 110,000 acres, and every endeavour should be made to increase the area sown for the 1954-55 crop. The decline in acreage in recent years has been due mainly to restricted sowings in Canterbury, and with the development of improved pastures there the need for periodic cropping is apparent if successful grass and clover seed crops are to be harvested. Farmers on heavy and medium land who have been for some years developing first-class pastures now find that if they wish to grow good crops of white clover and ryegrass seed, it is necessary for them to grow wheat in their rotation to avoid excessively rank growth in the seed crops.

WHEAT PRODUCTION

IT may be necessary to remind farmers who have not recently grown wheat that the seed-bed should be fine below but rubbly on top. Seed-beds that are fine on top will run together and cake with winter frosts and rains. Thus land for wheat sown after peas, potatoes, or another cereal generally requires very little work. After grass skim ploughing or surface working followed later by deep ploughing is necessary. Autumn-sown wheat is normally sown from late April to June, and spring-sown wheat in August or September. The main varieties used for autumn sowing are Cross 7 on medium to heavy soils, Fife Tuscan on light to medium soils, Dreadnought on heavy soils, and Hilgendorf on medium to medium-heavy soils. In Canterbury as a result of abnormal weather affecting the performance of Cross 7 in the 1952-53 season, the other three varieties markedly increased their proportion in the 1953-54 season. Hilgendorf has shown itself suitable in Marlborough and on the medium land of Mid-Canterbury and North Canterbury, where it deserves to be more popular than it has been, particularly in view of the price premium it receives. The main varieties for spring sowing are now Cross 7 and Tainui. Tainui is suitable for late sowings in the Manawatu, Rangitikei, and Wairarapa. Seeding rates for autumn-sown wheat on light to medium land are generally about 1½ bushels per acre, but for spring-sown crops on heavy land from 2 to 3 bushels are sown.

Superphosphate responses are most marked when wheat is sown after a cereal or run-out pasture, and the general recommendation to sow 1cwt. of superphosphate with wheat should be followed. After a wet winter nitrogen starvation frequently shows up in wheat crops; if so, a dressing of 1cwt. of sulphate of ammonia in September will give a payable response. The period when land is in wheat provides a good opportunity to spray with hormones as a method of control for weeds varying from annuals such as wild turnip to the perennial Californian thistle. Weeds should be sprayed when the wheat is about 6in. high. Wheat should never be sprayed when it has reached the shot-blade stage, as this is liable to affect flowering and subsequent germination of the seed set.

—*P. R. BARRER*

* * *

GRAZING MANAGEMENT OF YOUNG PASTURES IN THE FIRST YEAR

THE MANAGEMENT of a young pasture in the first year will largely influence its future productivity. New pastures sown in early autumn are normally ready for grazing in 5 weeks to 6 weeks. Care must be taken to graze early enough to avoid the smothering of young clovers by the quicker establishing grasses. The first grazing should aim to give a quick, even feeding off, and a large mob of sheep is ideal for this, but where dairy cattle only are available young stock should be used. Grazing when ground conditions are wet is best avoided to prevent pugging. Alternate grazing and spelling will maintain the new pasture in a vigorous condition through winter. Surface consolidation by early stocking with the development of strongly rooted grasses and clovers is particularly necessary to prevent frost lift. Weed infestation is much reduced if the young plants are encouraged to stool out rapidly and give good ground coverage. On dairy farms new pastures must be night grazed as well as day grazed to ensure an adequate return of animal dung and urine. Harrowing after each grazing will prevent undue clumpiness, and topping when necessary will maintain a vigorous, palatable sward. Closing for hay and silage crops should be avoided in the first year, as this smothers slower-establishing clovers, results in a poor recovery after the crop is harvested, and leaves bare patches open to weed infestation.

Wild turnip in wheat effectively controlled by M.C.P. and 2,4-D. The treated portion yielded 93 bushels per acre, and the untreated 57 bushels per acre.

FERTILISERS

Young pastures should be well supplied with their requirements of lime, phosphate, and potash. The lime should be applied some time before sowing and the superphosphate and potash at sowing time separate from the seed so that injury to seed germination is avoided. Young pastures also need 2cwt. to 3cwt. of phosphate in spring and a similar dressing the following autumn, except where fertility is extremely high. An application of more potash should be considered in spring where clover establishment has been poor on soils known to be potash deficient. It may be necessary to apply other fertilisers on problem soils such as peats where the addition of nitrogenous manures has proved invaluable. On other soils nitrogen should be used with caution. Trials in Auckland Province have indicated that harm may result from applying excess nitrogen to new pastures. One can best ensure that a young pasture is well supplied with nitrogen by seeing that the clovers are well established and grow vigorously. An adequate supply of lime, phosphate, potash, and molybdenum is essential for clover vigour. Many soils need only one or two of these added and the local instructor can advise on this.

—*R. B. BAKEWELL*

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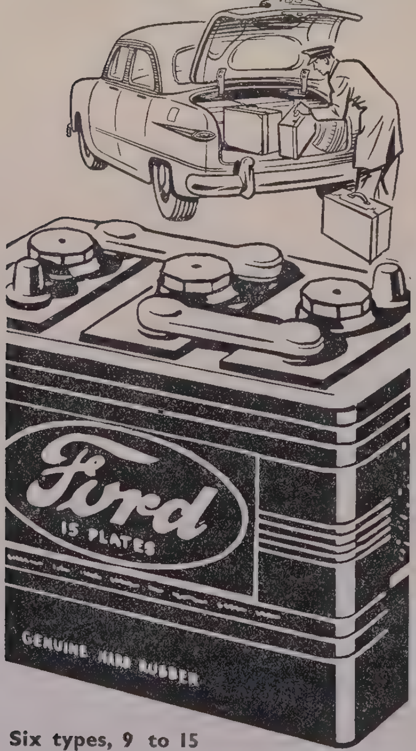

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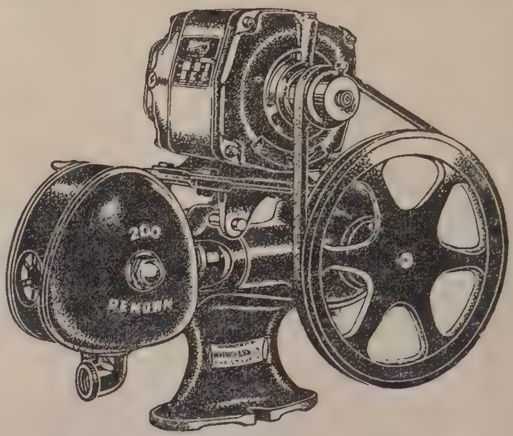

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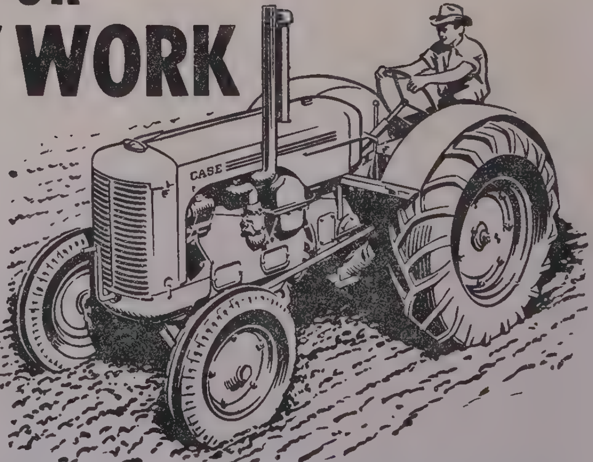

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Onion Growing in the Marshland District

EVIDENCE of the establishment of commercial onion growing by the early settlers of Canterbury is found in the export figures for 1898, which indicate that some 1800 tons of this commodity were sent overseas from Lyttelton in that year. The name Marshland has always been associated with onion growing in Canterbury and in this article F. G. Ferguson, Fields Instructor, Department of Agriculture, Christchurch, discusses the commercial practices adopted in that locality.

IN the years immediately before the Second World War the area in onions in New Zealand varied from 600 acres to 900 acres a year, and according to the crop it was necessary to import up to 3000 tons annually. During the war the acreage increased to a maximum of over 1900 acres in the 1944-45 season. The acreage during this period not only met all internal requirements, but contributed heavily to the requirements of the armed forces in the Pacific.

Since the war the acreage has fallen to an average of about 1200 acres annually, which normally allows for a small export.

Details of the tonnages exported in post-war years are:—

TABLE 1—ONION EXPORTS 1946-52

Year	Tons	Year	Tons
1946	1454	1950	1275
1947	1248	1951	2399
1948	2549	1952	1721
1949	1644		

Export supplies are derived mainly from North Island growing centres, with Canterbury growers providing the main South Island requirements and in addition supplying some North Island areas.

Soil and Climate

Onion culture is favoured by loose, friable, sandy loam or peaty loam soils that are well drained and subject to cool, moist conditions during early growth. A period of dry, warm weather in late summer and early autumn promotes maturity and ripening of the crop and ensures good-quality bulbs that will store satisfactorily. Being slow to establish from seed, the crop does not compete successfully with aggressive weeds, though modern methods of weed control involving the use of chemicals have done much to alleviate the weed problem. Nevertheless it is always advisable to adopt crop rotations and cultivation practices that aim at reducing the weed population of onion ground before sowing or planting the crop.

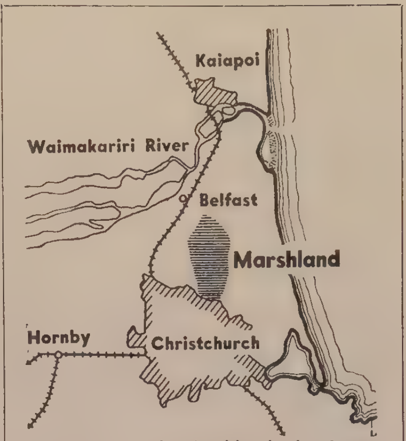
Varieties

Onions are obtainable in a number of varieties differing materially in average bulb size, time of maturity, and keeping quality. Varieties may be classified into three main categories, giant, long-keeping, and early-maturing. A less important class commercially includes the pickling varieties.

Giant varieties are generally not good keepers, though they produce heavy yields of large, mild-flavoured bulbs. They include Ailsa Craig, Prizetaker, and Giant Rocca.

The long-keeping types include the well-known varieties Brown Spanish, Straw Spanish, and Pukekohe Long Keeper, the last named a New Zealand selection of Straw Spanish and the most widely grown local variety for commercial onion production. Pukekohe Long Keeper is thin-skinned, mild flavoured, and relatively mildew resistant. It produces medium bulbs and yields consistently under a wide range of soil and climatic conditions. As the name implies the bulbs keep very well, and can be stored through to October or November when maintained in cool, dry, airy conditions. The early-maturing class, grown to a more limited extent for the early market, includes White Lisbon, Early Golden Globe, Odourless, and Silverskin.

Many of the varieties mentioned, though not grown extensively in commerce, are popular with home gardeners.



Location of Marshland district.

Marshland District

Waimairi County, with an occupied area of 28,000 acres, adjoins the northern boundary of the city of Christchurch. Though one of the smallest counties in New Zealand, it is one of the most intensively cultivated. Within its boundaries some 1070 agricultural holdings, averaging only 26 acres, are devoted largely to dairying and market gardening.

The Marshland district lies within Waimairi County just north of the Christchurch city boundary. Most of the land within this district is used for

Market garden area at Marshland. Poplars are used extensively for windbreaks.

market gardening and allied purposes including both potato and onion growing. In recent years rural land in Marshland as in other districts adjacent to rapidly expanding populous areas, has been encroached on as a result of urgent need for suburban dwelling sites. However, because of its location, the Marshland district is very well served by transport, trade, and market facilities, and close at hand is a ready source of casual labour to meet the seasonal requirements of market gardening and intensive cropping projects.

Waimairi County (and the Marshland district in particular) is the home of commercial onion production in New Zealand and is still one of the three foremost growing districts. At the turn of the present century it had already built up an export trade in this product and by 1917, long before commercial onion production had become a feature in the main North Island areas at Pukekohe and Opiki (Manawatu), some 275 acres of onions were being grown annually in Waimairi County.

The relative importance of the Waimairi County in relation to the other onion-growing districts of New Zealand is shown in Table 2.

Climate

The annual average rainfall for the Marshland area is about 26in. Usually this comparatively low precipitation is fairly evenly distributed throughout the year, though in common with other coastal areas of Canterbury, the district frequently experiences dry periods during November, March, and April. Though easterlies normally prevail, the district is at times subject to hot, dry north-west winds, but the comparatively high water-table of Marshland soils does much to counter local climate effects which would tend to cause droughty conditions.

TABLE 2—ONION GROWING IN NEW ZEALAND: ACREAGE, PRODUCTION, AND YIELDS
(All 5 years' average: 1945/46-49/50)

Land district and county	Area grown (acres)	Land district totals		Average yield (tons per acre)
		Area	Production (tons)	
North Auckland		347	3,114	8.9
Franklin County ..	340			
Other counties ..	7			
South Auckland		56	479	8.5
Tauranga County ..	44			
Other counties ..	12			
Hawkes Bay		81	602	7.4
Hawkes Bay County	79			
Other counties ..	2			
Wellington		366	3,402	9.5
Horowhenua County .	352			
Other counties ..	14			
Canterbury		374	3,432	9.2
Waimairi County ..	300			
Other counties ..	74			
Other districts	21	21	105	5.0
Dominion		1,245	11,134	8.9

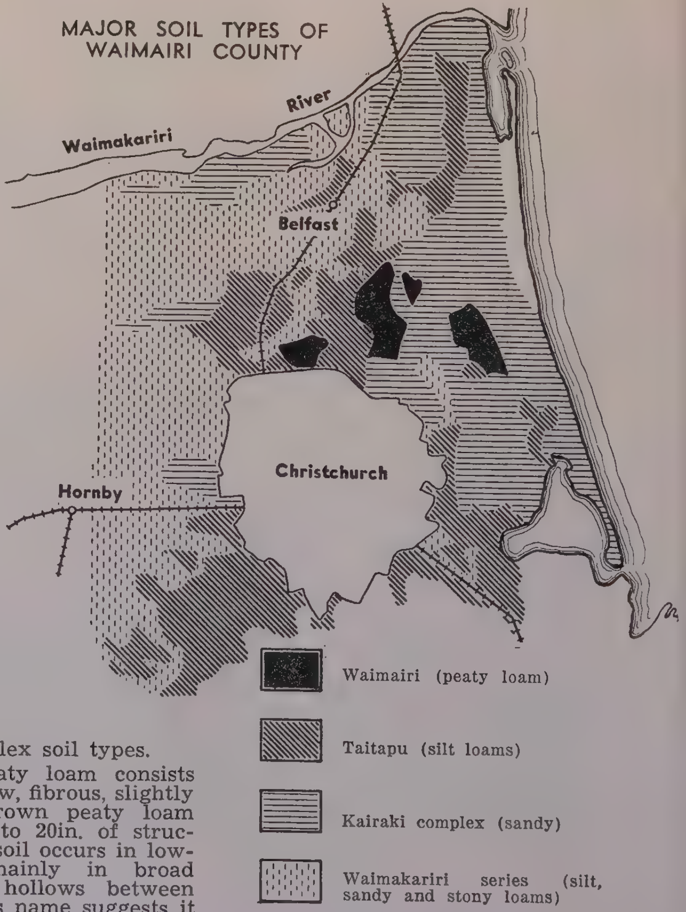
During the normal growing period (September to January) the average monthly rainfall is 2.1in.; during the maturing and ripening period (February to April) it is 1.85in. The maximum average monthly rainfall during the growing period is in December (2.4in.) and the minimum in November and February (each 1.8in.).

Mean air temperatures range from 48.7 degrees F. in September to 61.4 degrees in January. The average for spring and early summer is 54.4 degrees and for late summer and autumn 58.4 degrees. In winter, from May to August, there is an average monthly rainfall of 2.4in. and an average mean temperature of 44 degrees with frequent frosts of 10 degrees or over.

Soils

The occurrence and distribution of major soil types within Waimairi County is illustrated on the soil map below. Soil types include the Kairaki complex—largely fixed sand dunes interspersed with wet sandy hollows; the Taitapu silt loams—low-lying silty soils used extensively for dairying; the Waimakariri series of silt and sandy loams—cereal and potato cropping and market gardening soils; and the Waimairi peaty loams, which are favoured for market gardening. It is on the comparatively limited area of the Waimairi peaty loam soils of the Marshland district that onion growing finds most favour. The culture of this crop also extends on to the Waimakariri sandy loam and, to a less extent, on to drained areas of the Taitapu silt and low-lying areas of the Kairaki complex soil types.

MAJOR SOIL TYPES OF WAIMAIRI COUNTY



The Waimairi peaty loam consists of 9 to 12in. of mellow, fibrous, slightly granulated, dark brown peaty loam topsoil overlying 9 to 20in. of structureless peat. This soil occurs in low-lying situations, mainly in broad depressions or in hollows between sandy ridges. As its name suggests it has been developed from swampy marshlands. When adequately drained the land produces a deep, friable soil, easily cultivated and very suitable for onion growing and market gardening generally.

Waimakariri sandy loam is a dark grey sandy loam soil overlying silt or sandy loam subsoil. It occurs extensively adjacent to the main river systems of the Canterbury Plains, where it is widely utilised for potato growing and other cropping.

Crop Rotations

Onion growers of the Marshland district are also largely concerned with the production of potatoes and market garden crops such as cabbages, cauliflowers, carrots, and parsnips. As the onion crop is susceptible to weed invasion and is also a gross feeder, crop rotations are generally planned to include a preceding cleaning crop, and, in many instances also, a crop that benefits from freshly added farmyard manure or sludge. Occasionally, green manurial crops are also worked into the rotation to maintain the humus content and nitrogen status of soils. Two commonly employed rotations are:—

Early potatoes, cabbages or cauliflowers, onions, potatoes.

Potatoes, onions, cabbages or cauliflowers, potatoes.

Sometimes peas are substituted for the brassica crops in these rotations or the rotation is extended to include root crops (for instance, potatoes, cabbages or cauliflowers, onions, carrots or parsnips, potatoes). Where green manuring crops (principally barley or oats, though sometimes lupins) are included they generally fit in between the autumn harvest and spring sowing or planting periods.

Potatoes and carrots act as excellent cleaning crops and cabbages and cauliflowers respond well to freshly applied strawy farmyard manure, which, in turn, develops into well-rotted humus to benefit the following onion crop. A rotation in which onions immediately follow potatoes appears to be most favoured, partly because brassica roots are not readily disposed of when the ground is being worked to the fine, firm, even tilth required for onions as the following crop, and partly because of the limited time between the harvesting of the brassica crop and the sowing of the onion crop.

A few growers use the same ground for onions for two or more consecutive seasons, but in so doing run the risk of a build-up of disease in the soil.

Ground Preparation

Preparatory working of the ground for onion growing is generally straightforward. Immediately the previous crop has been harvested in autumn the area is deep ploughed (to a depth of 8 to 12in.) and winter fallowed. A second shallow ploughing may be given in spring followed by discing and tine harrowing.

Final preparation consists of consolidating the seed-bed with a Cambridge roller or a clod crusher-leveller. For successful establishment of onions a fine, firm, level seed-bed is essential. Adequate consolidation is particularly important on the loose, peaty soils of the Marshland district to ensure even sowing and rapid germination of seed and hence quicker establishment of the crop. On the favoured soil types of the Marshland district there is no fear of surface caking due to over-consolidation.

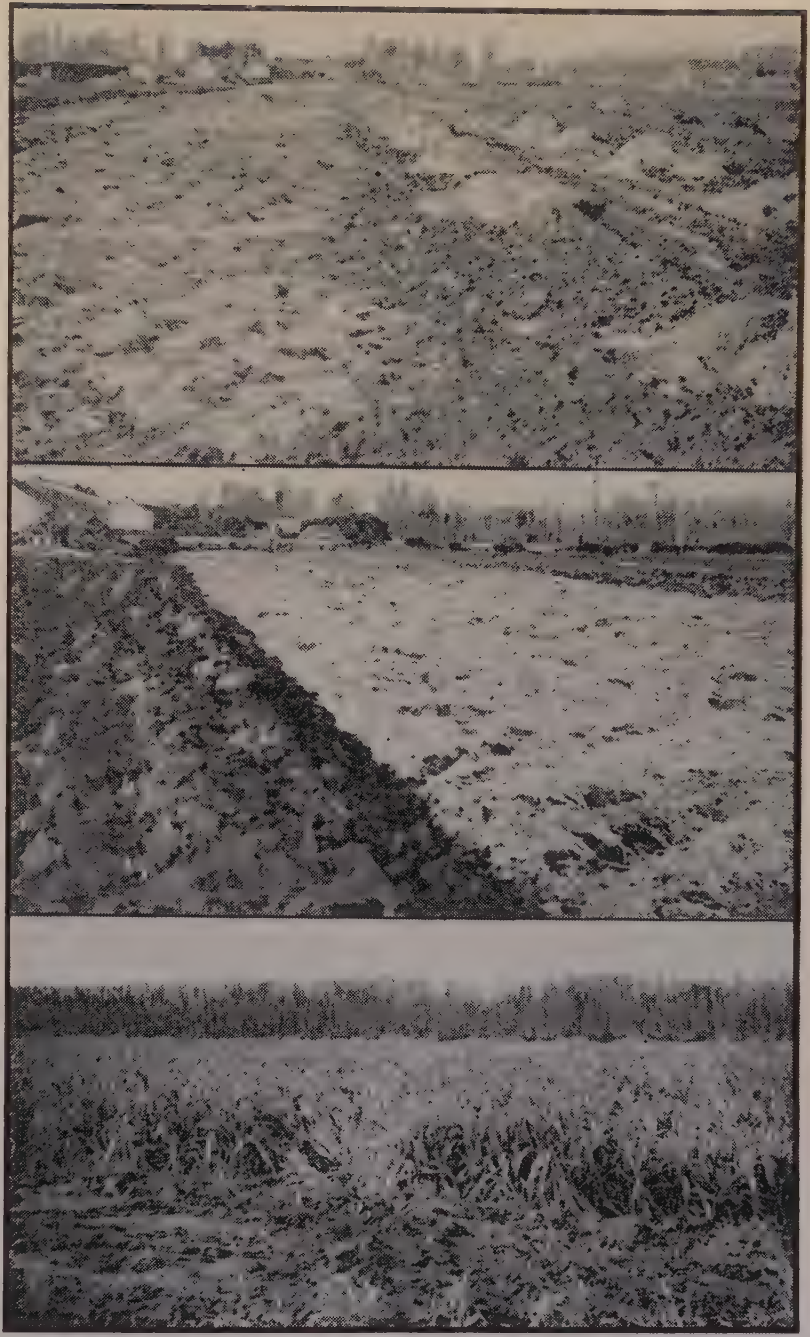
It always pays to begin preparatory operations early to gain the advantage of a winter fallow and natural consolidation. Where autumn-sown green manure crops precede onions they are ploughed in during early winter.

Methods of Establishment

There are two methods of establishing commercial onion crops:—

1. By direct drilling of seed in the spring in 12 or 14in. rows at the rate of 4 to 5lb. of seed per acre.
2. By transplanting seedling plants in early winter (June) or in spring (August-September). Seedlings are raised by sowing seed in beds in autumn (March-April) in 12in. rows at the rate of 1oz. of seed per chain of row. Obviously this method is more laborious, time consuming, and costly, but compared with the direct drilling method it has distinct advantages on land where onion mildew and other diseases are likely to be prevalent and on soils subject to heavy infestations of weeds.

In the Marshland area onion crops are almost invariably spring sown. The seed, chiefly of the Pukekohe Longkeeper variety, is drilled directly into the field in September at 5lb. per acre in 14in. rows. Hand-operated single row seeders, drilling to a depth of ¾ to 1in., are most commonly employed, though with labour scarcity increasing and costs rising, many growers are now changing over to multi-row power-drawn units. Not only do these machines reduce labour requirements and costs and speed up sowings, but they are capable of carrying larger tanks from which formalin solution is applied with the seed. The application of formalin at sowing is a standard practice to guard against onion smut infection.



Restoring fertility. Upper—Heaps of straw and stable manure partially spread for ploughing in. Middle—Same area, showing (at left) strawy material being ploughed under. Lower—Crop of oats ready for ploughing in as green manure.

Fertilisers and Lime

As the onion crop makes considerable demands on soil fertility, it is customary to make relatively heavy applications of organic and inorganic fertilisers before sowing.

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The Waimairi peaty loam is fairly acid and low in phosphate, potash, and lime.

Organic fertilisers, especially fresh strawy farmyard manure, are best applied under the previous crop, ploughed down during autumn, or composted until spring and ploughed in when the seed-bed for onions is being worked up. These practices afford the material time in which to rot down. If fresh organic matter is added shortly before seeding, onions tend to develop the undesirable characteristic of thick neck growth.

Manure spreaders are used by some growers in distributing organic wastes, which are generally applied as dressings of approximately 10 tons or more per acre.

Some growers who use farmyard manure or sludge waste do not usually apply any artificial fertilisers. Where artificial fertilisers alone are used the normal application is 5cwt. of blood and bone and 1cwt. of superphosphate per acre. This mixture may be broadcast and lightly worked into the soil or it may be drilled in the rows at a depth of 1½ to 2in. just before the seed is sown.

It is a common practice in Marshland to apply 1 ton to 25cwt. of lime per acre. This is normally applied to winter-fallowed land. These heavy rates of liming are usual when a green manure crop is being ploughed in or for the first year or two during the development of land for market gardening.

Subsequent Cultivations

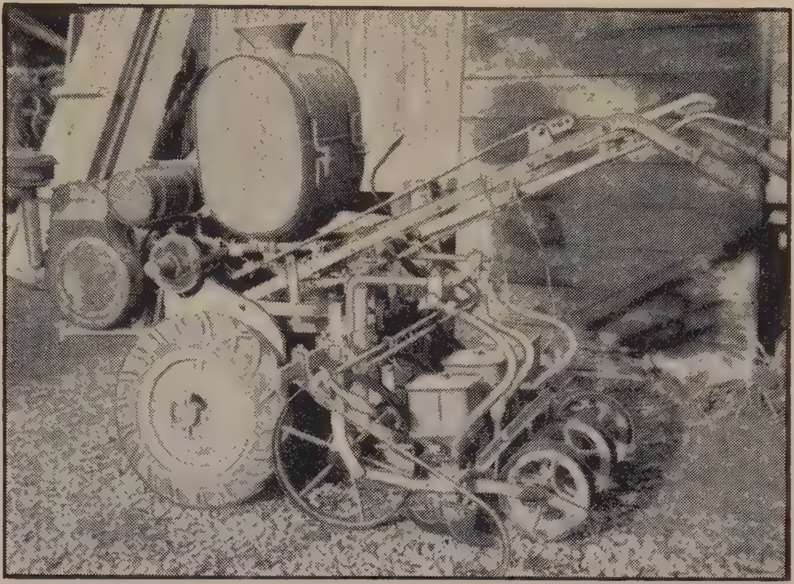
About 10 days after sowing, the area is manually top hoed as a pre-emergence weed-control treatment. This is done with conventional push hoes, and the shallow cultivation destroys weed seedlings and assists the more slowly establishing onion seedlings when they emerge in their keen competition with rapidly invading weeds.

Once the onion seedlings are apparent in the rows intercultivations are carried out with push hoes of both hand and wheel types, the hand hoes being used to eliminate weeds from the centre of inter-row spaces and the wheel type for closer working.

Later, when the crop is well established, mechanical inter-row cultivation is adopted, and this is supplemented, especially in wet seasons, by hand weeding within the rows. It is essential to maintain a weed-free crop; otherwise in the early stages weed competition will smother the establishing crop. If weed growth is fairly thick at harvest time it seriously interferes with proper ripening and maturing of the bulbs.

Chemical Control of Weeds

In recent years by employing chemical methods of weed control a number of growers have reduced appreciably the amount of labour and the number of manual and mechanical intercultivations normally required for the crop. The chief chemical used in the Marshland district is sulphuric acid of 1.83 specific gravity. A 7½ to 10 per cent. solution of the acid in water applied while onion seedlings are still small (about 3in. high) will control weeds without injuring the crop. The smooth, waxy coating of onion leaves readily sheds the spray solution, thus preventing crop injury. The D.N.B.P. sprays used in some other onion-growing areas are not extensively used in Marshland.



Three-row seeder with formalin tank and hose attachments for disinfecting the soil during sowing.

Harvesting

Local main-crop onions begin to mature in February and harvesting operations take place during February and March. The usual procedure is to hand pull the bulbs, three rows being gathered together into one central row. The bulbs then remain in this triple-row swath to ripen, which normally takes 7 to 10 days but varies with prevailing weather conditions.

When the bulk of the crop has ripened, and this is indicated by firm, hard bulbs with dry, papery tops, the bulbs are hand topped with shears and two triple rows are put together during the process in readiness for gathering and removal from the field. After being topped the crop is immediately gathered out of the wide, 6-row swaths. The bulbs are hand graded and either bagged in open-meshed onion bags or crated in slotted crates for dispatch to the local market or for storage on the property to await disposal later.

If the topped bulbs become damp before crating or bagging, they are removed from the field when wet and spread out under cover to dry. Once they have been topped bulbs left out in the field in wet weather become very susceptible to neck rot.

Mechanical lifters and toppers have recently appeared in the Marshland district though, as yet, they are not widely used.

Storage

Though some of the produce may be dispatched direct from field to city stores and markets, it is usual to store part of the crop for varying periods. Supplies are thus marketed at intervals from February or March to as late as October or early November. This evens out supply and demand, and growers who store derive a benefit from price increases that usually occur as the off season progresses.

Onions are stored mainly in bags or crates stacked in dry, well-ventilated sheds after grading for quality has been done in the field or in the shed. Grading in the field consists of sorting out into lines according to relative soundness, size, and freedom from disease and blemishes and is done as the crop is being gathered. When bulbs are graded in the shed they are run over a grading table and hand sorted. A few growers are now using mechanically operated grading tables.

Periodically the stored produce is inspected and, if necessary, regraded for the removal and disposal of bulbs of inferior keeping quality. Usually only one regrading is necessary—occasionally two regradings—though more frequent inspections are required after unfavourable harvesting seasons or toward the end of very long storage periods.

Yields

The average yield per acre for commercial onion crops grown in Canterbury is approximately 9¼ tons. This average is calculated from the agricultural and pastoral statistics for the 5-year period 1945-50.

In exceptional seasons some Marshland crops may yield up to 30 tons per acre, and in good years the average approaches 15 tons.

Diseases and Pests

Though Marshland crops are not generally prone to many diseases and pests, preventive or control measures occasionally become necessary. Good hygiene is one of the best safeguards against disease and insect infestations and most local growers are fully alive to this.

[Green and Hahn

Topping onions after the crop has been pulled and the bulbs from each three rows placed in one. After being topped bulbs from each pair of rows are concentrated in one wider row as shown on the extreme right.

The following are diseases and pests of the onion crop which may occur in the Marshland district:—

Onion Smut

Onion smut (*Urocystis cepulae*) is the most troublesome disease in the Marshland area, and unless preventive measures are taken, losses from this disease can be very serious. The causal organism, a soil fungus, can remain viable in the ground for many years, even without the presence of its onion host. Hence crop rotation, though beneficial in other respects, is by no means effective in preventing the occurrence of onion smut.

The fungus attacks onion seedlings in the early stages and appears as dark brown or black spore blisters either on the surface or within the cavities of the leaves. Most affected plants die before harvest, but any reaching maturity are rendered unsaleable by a covering of black spores.

Onion smut can be combated effectively by applying formalin solution at a concentration of 1¼ fl. oz. of 40 per cent. formalin in 1 gallon of water to the seed furrow at the time of sowing. One gallon of solution is generally sufficient for 250ft. of row.

Neck Rot

Neck rot (*Botrytis alli*) is another fungous disease. Though not normally troublesome in Marshland, it is likely to appear in wet harvesting seasons. Bulbs that are not thoroughly dried out before storing or which remain wet for a period during ripening and maturing, especially after topping, are most readily infected by neck rot. The fungus usually gains entry at the necks of bulbs, at or about harvest time, and gradually works downward among the compressed, scale-like leaves to cause rotting and decay of bulbs. Infection becomes progressively worse during storage, especially if affected bulbs have not been thoroughly dried out and stored under cool, dry, airy conditions.

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The above bulletins, part of a series of over 350 on all aspects of farming, are available post free from the nearest office of the Department of Agriculture, or from the Head Office of the Department, Box 2298, Wellington.

Apart from care during ripening the only method of combating neck rot is to eliminate and destroy infected bulbs at harvest time. If possible, the remaining bulbs should be marketed promptly to avoid further losses.

Onion Mildew

Onion mildew (*Peronospora schleideni* syn. *destructor*) is a serious and rapidly spreading disease, which occurs occasionally in Marshland crops. The fungus attacks plants at any stage of growth and is favoured by cool, moist conditions in sheltered fields. Infected seedlings and young plants develop pale spots on the leaves, the infection gradually, though at times rapidly, spreading as a downy coating that later turns to a black mould over the whole of the plants. Affected plants normally wither and die.

When crops in the field become infected at a later stage of growth the disease may develop progressively during storage and lead to severe wastage of bulbs.

The fungus spores may be seed borne, they may be carried on transplants raised in infected seed-beds, or they may over-winter in the soil. Pukekohe Long Keeper variety is relatively resistant to this disease, this being one of the reasons for its popularity with local growers.

Where mildew is likely to occur it can generally be prevented by sprayings at 10- to 14-day intervals with a 3 : 4 : 50 Bordeaux mixture plus 2 pints of summer oil per 50 gallons of solution as a wetting agent. Spraying should begin before the appearance of the disease, which is most likely to develop in sheltered fields during moist weather.

Early planting and attention to crop hygiene and rotation help to minimise the risk of mildew infection.

Onion Thrips

Onion thrips (*Thrips tabaci*) are minute, feather-winged insects 1/15 to 1/25in. long which are serious pests of onions in some northern districts and are somewhat difficult to control. Fortunately they are not serious in the Marshland area.

Some measure of control can be obtained by fortnightly spraying with a mixture of nicotine sulphate (1 gallon) and wettable D.D.T. (10lb.) in 500 gallons of water. This solution is applied at the rate of 100 gallons per acre. A 0.1 per cent. spray of D.D.T. may also prove reasonably efficient.

Treatment should begin as soon as the first thrips appear.

Honey-filling Machine

MECHANISATION of the honey-filling machine has considerably increased the rate at which honey can be filled into various sized containers and at the same time reduced the manual effort required for the work. In this article C. R. Paterson, Apiculturist, Department of Agriculture, Hamilton, deals with the general set-up of a honey filler and the routine method of making adjustments.

THE motorised honey filler has now become popular with beekeepers who have to pack a considerable portion of their crop into small containers for local sales. Like all other pieces of mechanical equipment, this machine must be set up properly and correctly adjusted before the best results can be expected. The rate at which containers can be filled will be governed to a large extent by the ability of the operator to synchronise his movements with those of the machine.

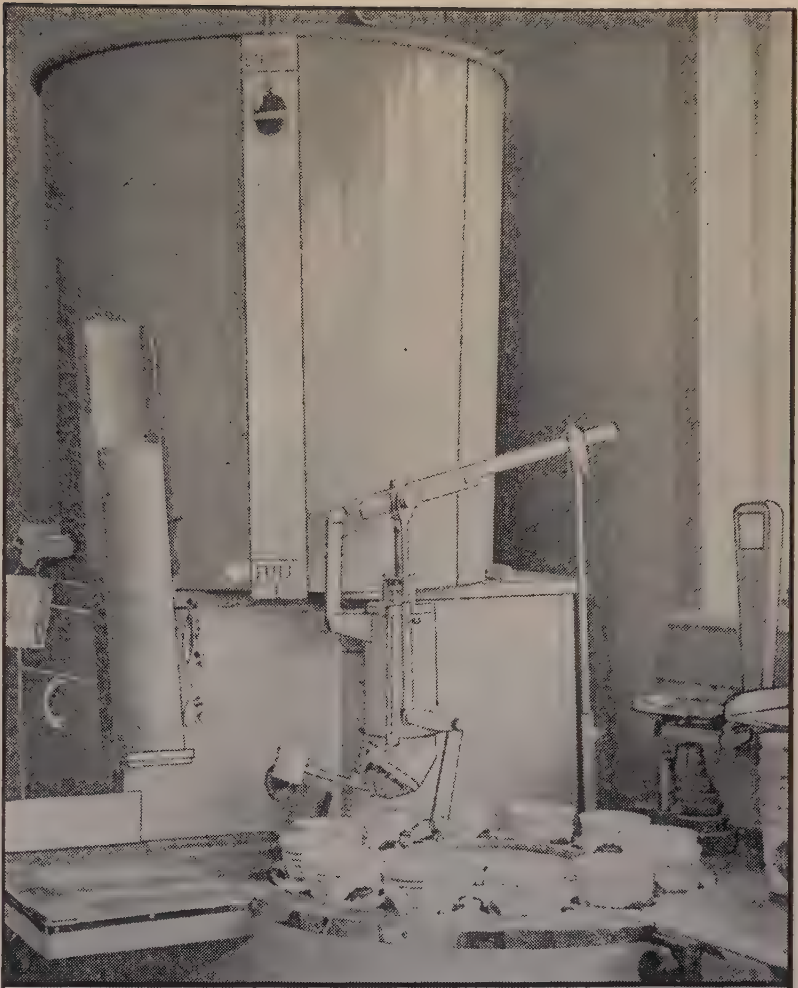
The location of the filler in the packing room will depend very much on the general layout in the honey house. Mr. J. B. Mackisack of Waitoa has placed his machine in a corner near the door of his packing room. This position is very handy because the filled cases can be transferred by a roller platform into Mr. Mackisack's main storage room. Fig. 1 shows how this beekeeper has neatly covered in the machine and yet has all the essential parts readily accessible. The space under the holding tank is built in with a cupboard. Fig. 2 indicates how a door can be let down to form a solid platform so that odd sized containers can be filled from an ordinary honey gate.

The carton lids are held in a special container at left in Fig. 1. This prevents them from slipping all over the table and at the same time makes them easy to pick up when one's attention is directed to the moving platform. At right in Fig. 1 can be seen the tested scales which are used for periodical weight checks.

Fig. 3 shows how this machine has been marked to indicate the different adjustments for various sized containers. This saves much time when changing over from 1lb. to 2lb. containers and is of great assistance should a new operator have to make adjustments.

Adjustments

The alteration in length of stroke by adjustments on various levers can become quite tantalising unless one understands what is going to happen when a lever is moved a short distance. A careful study should be made of Fig. 4 so that when an adjustment is made the beekeeper can expect a certain result.



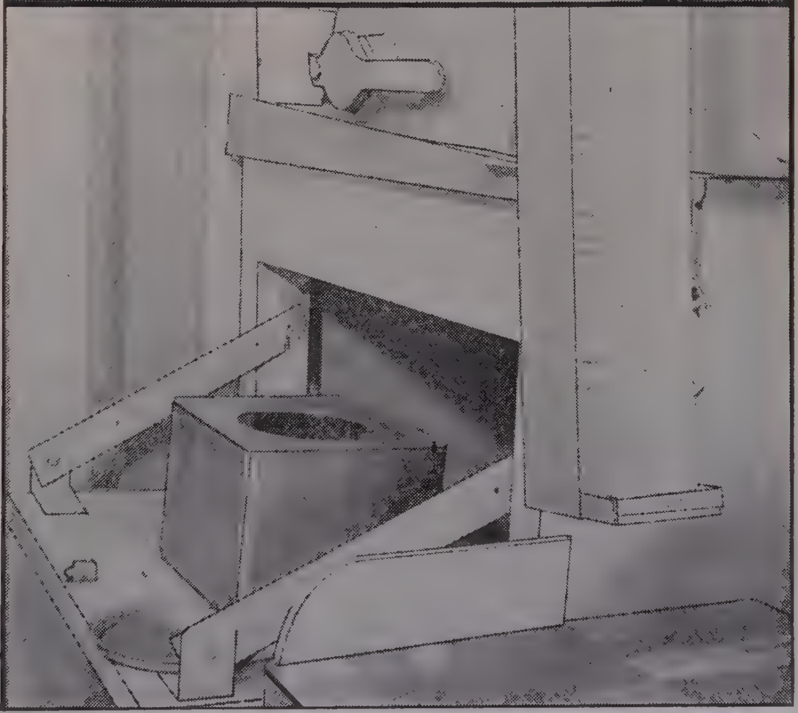


Fig. 1 (upper right)—Honey-filling machine and holding tank. Fig. 2 (lower right)—Method of utilising space under holding tank.

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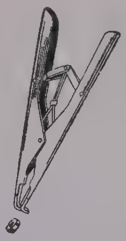

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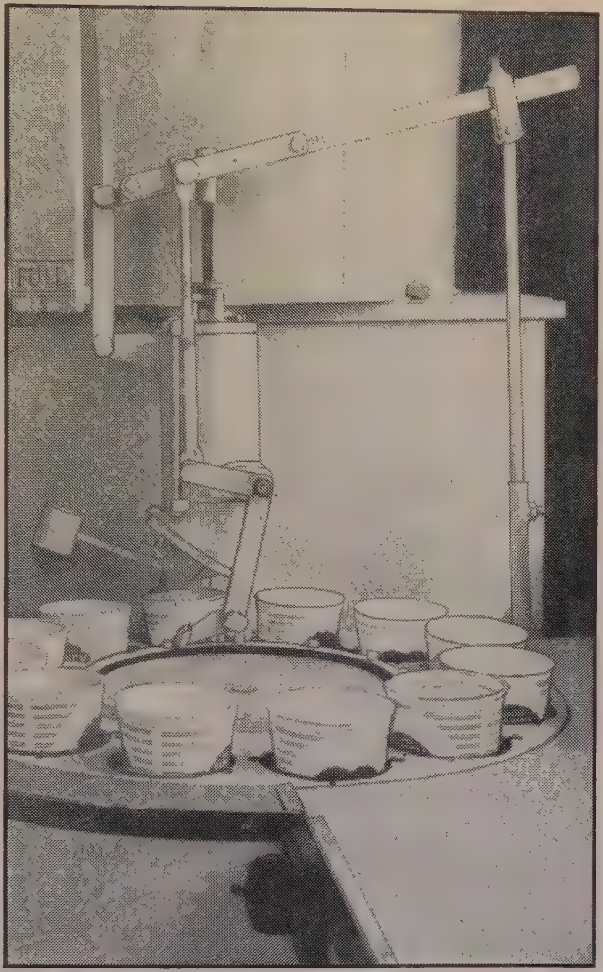

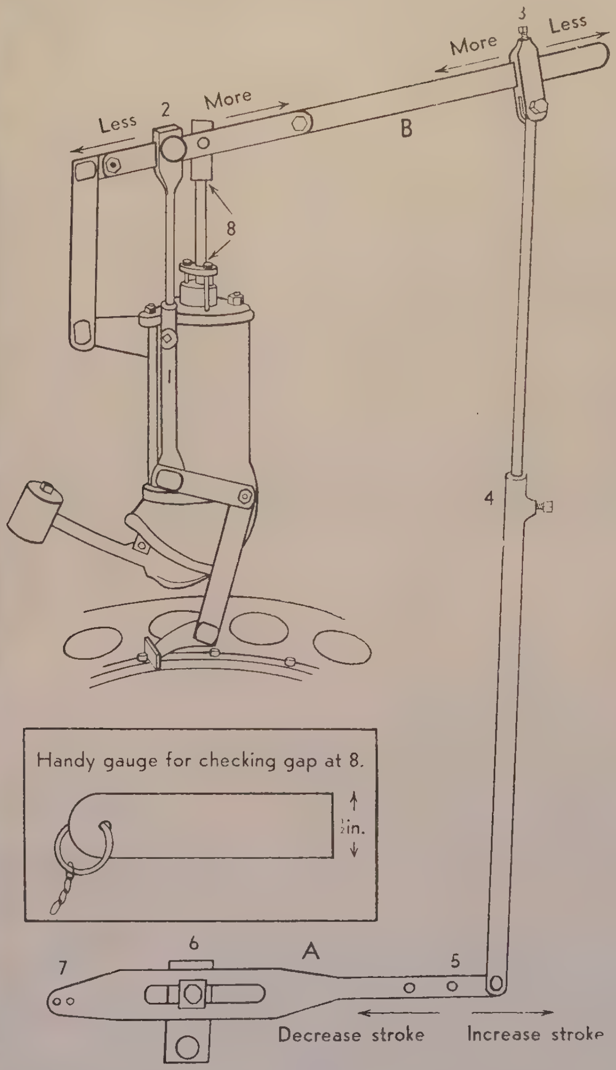

Fig. 3 (above)—Honey filler, showing adjustment marks.
Fig. 4 (right)—Adjusting points (see text below).

Arm A can be called the driving lever, so that any movement at 5 outward will increase the length of the stroke. Because lever B is the driven lever, movement at 3 has to be made inward to increase the stroke of the pump rod. The position is slightly changed when the rotation of the table is considered. Lever B becomes the driving lever, so that to increase movement of the table, 2 has to be moved outward, thus increasing the stroke. The arrows shown in Fig. 4 should make it quite clear which way to make adjustments for a certain setting.

Description of Adjustments

The adjusting points on the honey-filling machine shown in Fig. 4 are:—

Rotating Table

1. Table centring adjustment.
2. Table travel adjustment.

Filling Plunger or Piston

3. Fine adjustment for weight.
4. Adjustment for placing piston in correct position. (No. 4 is not a weight adjustment.)
5. Intermediate weight adjustment.
6. Primary weight adjustment.
7. Determines speed of return and cut off. The inside hole is used for 1lb. cartons or smaller and the outside one is used for 2lb. cartons.
8. Gland and piston rod end. Half an inch should always be allowed between these points when the piston is at the bottom of its stroke. This gap is set by adjustment 4.

Before Setting Filler

1. Disconnect 3 and pump by hand 6 times to the full extent of the piston stroke, thus eliminating air from the cylinder.
2. Connect 3 and turn the machine by hand to ensure that everything is clear and in working order.

To Set Filler (Say, for 2lb. Carton)

Place bolt in outside hole at 7.

Adjust 6 for approximately 2in. of off-set, that is, 4in. throw; then bring the piston to the bottom of its stroke and set ½in. gap at 8 by adjustment 4. Now try a carton for weight; if it is too heavy, move 5 in a hole (reduce stroke) and again try a carton. If the carton is now just a little too heavy, move out fine adjustment 3, thus reducing the stroke of the piston until the exact weight is attained.

If correct adjustment cannot be obtained by 5 and 3, the throw 6 will have to be moved in to reduce the stroke and out if weight has to be increased.

Each time the stroke of the pump is altered to adjust weight a check must be made on the ½in. gap at 8.

Table Setting

Place a carton on the table under the valve, bring the piston to the bottom of its stroke, and then set the pawl behind the relative peg on the table so that it is in a pushing position (1). Now take the piston to the top of its stroke and slide 2 along until the pawl engages behind the next pin on the table. By returning the piston to the bottom of its stroke a check can be made in the position of the next carton. By slight adjustment of 1 and 2 the desired position can be obtained. Always stop the filler on the up stroke to ensure a full carton.

The honey filler is a useful piece of mechanical equipment. It should be maintained in good order by attention such as frequent oiling and thorough cleaning when it is not in use.

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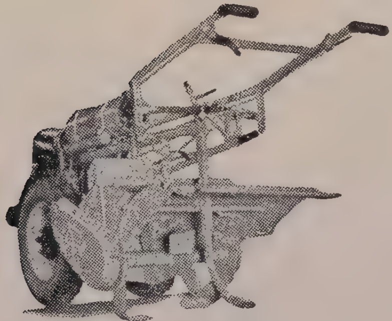

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Gorse Control on Hill Country

WANGANUI and Waitotara Counties have many thousands of acres of gorse-infested hill country. In the past much time and effort had been put into gorse clearing, but little over-all progress had been made in its elimination. This position has fortunately been considerably altered over the last 2 years owing to the introduction of 2,4,5-T hormone. Accompanying this development favourable prices for primary produce have made capital available for clearing and for the more extensive use of tracklaying tractors on hill country. In this article A. A. Duncan, Instructor in Agriculture, Department of Agriculture, Wanganui, describes the methods and equipment recommended for dealing with gorse at various stages of growth.

THE use of 2,4,5-T has not entirely altered the routine of gorse control. Though it has replaced the grubber and the draining spade for the control of regrowth gorse, with "old man" gorse there is still the problem of initial clearing, as at least some cutting or burning and breaking of the sticks has to be done to enable operators to get among the gorse with spraying equipment.

"Old Man" Gorse

Cutting and Burning

The standard method of controlling "old man" gorse over the years has been cutting and burning, the gorse being cut in winter or early spring and burnt the following autumn. Winter is the best time to cut, because this allows the gorse to dry out thoroughly by February or March and also allows the spring growth of grass to accumulate and dry out so that it will add heat to the fire. A combination of these two factors ensures a hot, clean burn. The area should be fenced off to exclude stock from the time the gorse is cut until after it has been burnt and to allow subsequent crushing with stock.

After the burn in March the area is sown while the ash is still warm and topdressed with 3cwt. of phosphatic fertiliser. The paddock is then left until the grass has grown about 3in., when it is grazed off quickly with as large a mob of sheep as possible (300 to an acre is not excessive) and then spelled completely from stock until the pasture growth warrants a repeat treatment. The concentration of stock is a particularly important phase of gorse control, because when the sheep are on heavily enough they eat the gorse seedlings off at ground level and this kills a tremendous number of the seedlings. With a good burn and good grazing management very little regrowth gorse appears and what does get away can be sprayed the following summer. Cutting and burning make a very clean job, but the method is slow, arduous, and expensive, and only a small area can be done each year with normal farm labour. It costs up to £35 an acre to cut gorse when it is thick and overhanging, as it often is on hillsides.

Burning and Clearing the Sticks

Burning the standing gorse and breaking the sticks off 2 years later is another method of controlling "old man" gorse. The sticks are thrown into heaps and burnt; the area is then ready for spraying. After a 2 years' lapse even the biggest of the stumps can be easily broken off and the job of heaping and burning can be done for £8 per acre. Clearing of the sticks changes entirely the appearance of the area and in fact converts the area from a tangled mess into something quite presentable and readily accessible with spraying equipment. It has the appearance of an area on which the gorse has been cut and burnt and which has regrowth coming away strongly. Firing gorse causes a lot of seed on the ground to germinate, a desirable feature in that once the seed is germinated it loses its potential to reinfest the area later.

With this method fencing off into convenient blocks is still important, because it is necessary to concentrate sheep on the area when the gorse seedlings appear after the burn. The use of wire battens and a fairly high proportion of iron posts cuts down fencing losses when the gorse is fired. For success the summer must be reasonably dry to allow a good fire in the standing gorse and the gorse must be at least 6 years old, as younger gorse will not carry a satisfactory fire. The method would not be altogether satisfactory on shady faces with a heavy subsoil, because this type of location promotes quick gorse growth and the gorse would have grown too high for easy access by the time the sticks had rotted.

Bulldozing

Though bulldozing is limited to country where a tracklaying tractor can operate, a considerable acreage of gorse on hill-country holdings can be treated in this manner. Provided the slope is relatively even and the operator has a place at the bottom to turn, the bulldozer can clear quite steep country. The machine is operated downhill with the blade a little above ground level. The thick stumps of the "old man" gorse offer sufficient resistance to the blade for the roots to be pulled out of the ground and in consequence very little topsoil is removed. The gorse is swept into rows up to a chain apart and these are burnt the following summer. The area is sown after clearing and then crushed with stock when necessary. The bulldozer

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HEADING PHOTOGRAPH: Wanganui and Waitotara Counties have large areas of gorse-infested hill country.

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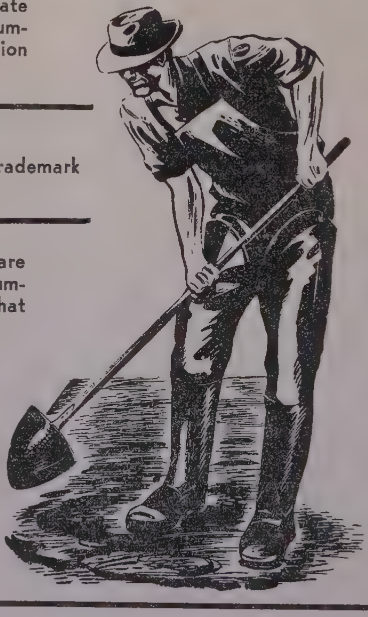


blade is the cheapest and quickest way of clearing, as on average hill country an acre can be done in 6 hours at a cost of £14.

The method is not satisfactory for whippy gorse, because such growth does not offer sufficient resistance to the blade and bends over. To clear such gorse the blade has to be lowered into the ground and this removes too much topsoil, which, as well as being bad in itself, prevents a good burn in the rows, leaving the paddock untidy for a long time.

Regrowth and Scattered Gorse

Regrowth gorse is most efficiently controlled with 2,4,5-T hormone. Application of this chemical with a power sprayer is a much quicker method than control by grubbing and makes a more satisfactory job, because it does not disturb the surface of the ground. Maintaining the pasture cover intact is important, because if the surface is disturbed, it is probable that new gorse seedlings will grow. The best time of the year to spray is from the beginning of November until the end of March. Satisfactory kills have, however, been obtained outside this period by use of an increased amount of hormone per acre. The gorse should not be sprayed when it is heavily in flower, because the flowers drop off after treatment and consequently the hormone is not taken into the plant's system.

The regrowth is sprayed in the first or second summer after burning, according to the growing conditions. On shady faces it is usually necessary to spray the regrowth in the first summer, and on light soils with a sunny aspect it may be desirable to wait until the second season. In general it is not wise to spray very young regrowth, as it is better to wait until it is at least a foot high. Regrowth about 2ft. high is ideal for spraying.

Water Supply Important

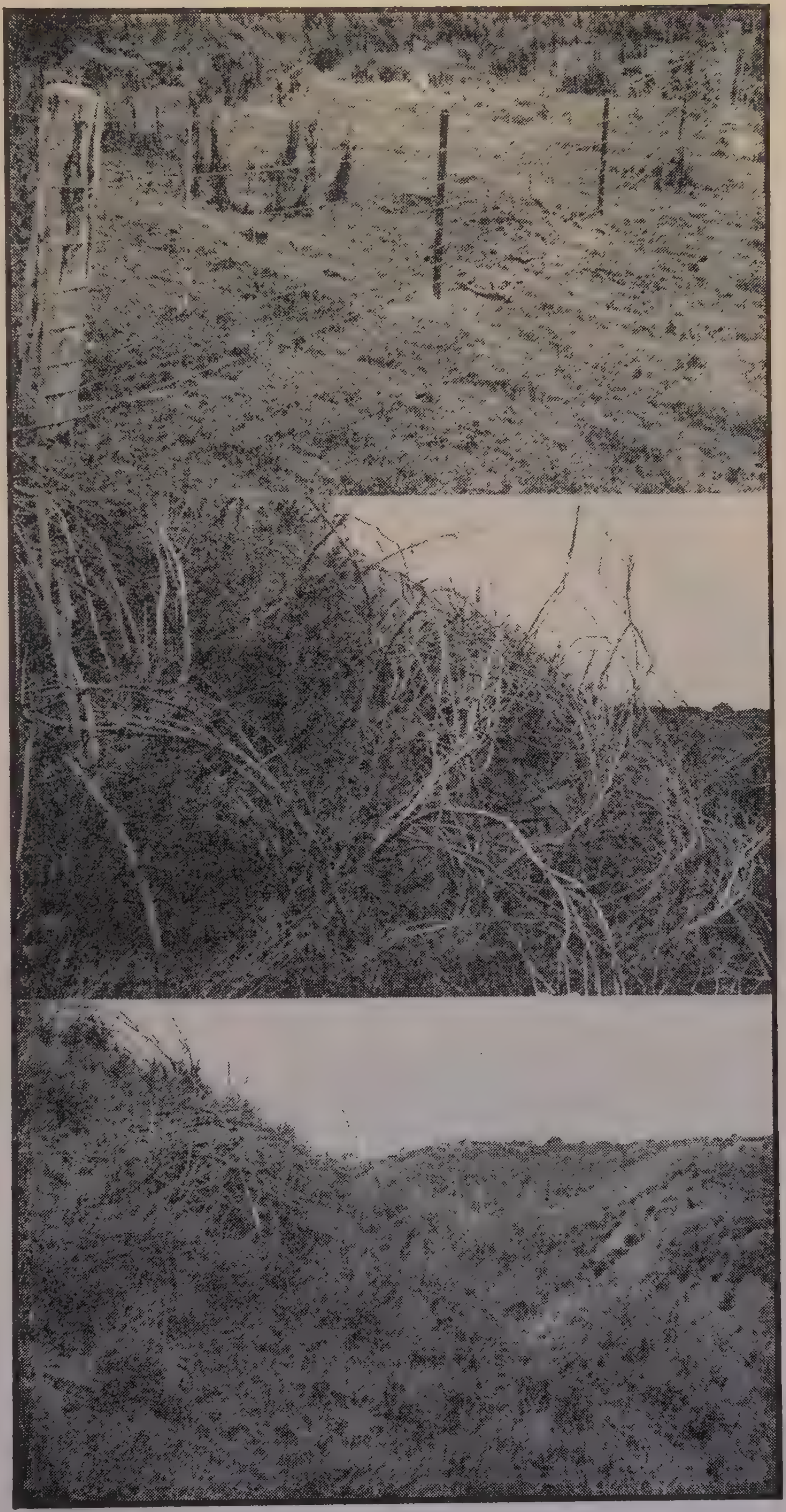
The biggest factor to consider in power spraying is the supply of water; 200 to 400 gallons per acre are required according to the type of unit used and the height and density of the gorse. There are several ways of getting the water to the job. One is to bulldoze a track handy to the gorse and cart the water out with a tractor and trailer; another is to install a series of 44-gallon drums on the hillside and pump the water up to them from a creek at the bottom of the gully. A third method, which is limited to locations with an impervious subsoil, is to make a dam on the hillside and pump directly from it. Whichever method is used it is essential to have clean water, as dirty water soon clogs the nozzle of the spray gun. A filter should always be used.

Types of Spraying Units

For the purposes of classification the types of sprayer can be broadly divided into four: The knapsack, the low-volume unit, the intermediate power unit, and the large power unit.

Knapsack Sprayer

The knapsack sprayer is only of use on small scattered gorse, although in the past sizeable areas have been treated with it. The object in employing it is



Upper—The use of wire battens and a proportion of iron posts is an advantage where gorse is burnt. Middle—Gorse fired 2 years previously and before the sticks are burnt. Lower—Sticks of gorse cleared and thrown into heaps for burning and the area ready for spraying.

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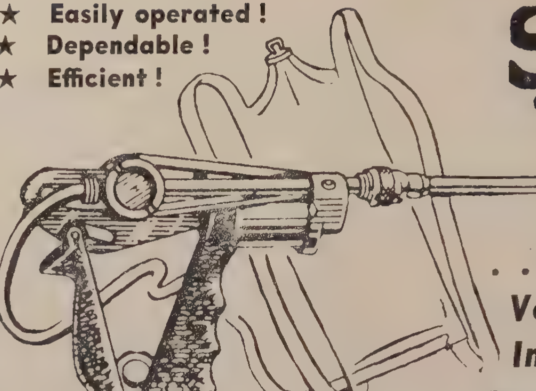

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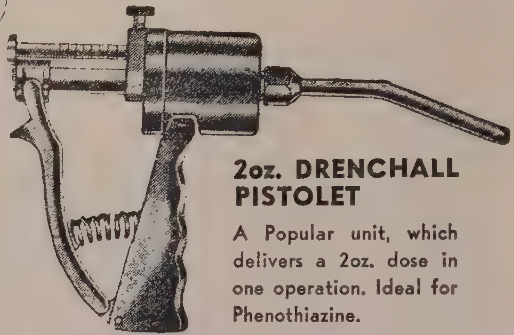

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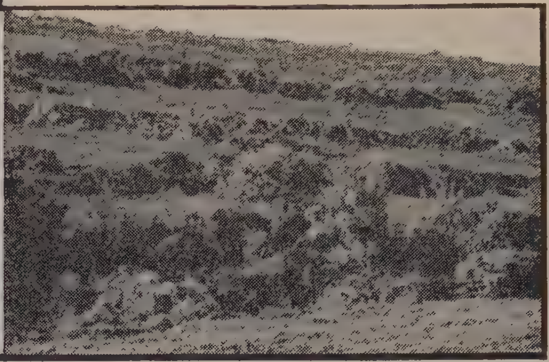
Left—Clearing "old man" gorse with a bulldozer. Below—The gorse is swept into rows about a chain apart to be burnt the following year.



to use as small an amount of water as possible consistent with getting a complete cover. One or perhaps two low-volume nozzles (28 or 32 gauge) are fitted to the knapsack, and a relatively strong mixture of 6oz. of volatile 2,4,5-T to 3 gallons of water (1 in 80) is used. When a small volume of water is used the volatile product helps to give a more efficient cover.

Low-volume Unit

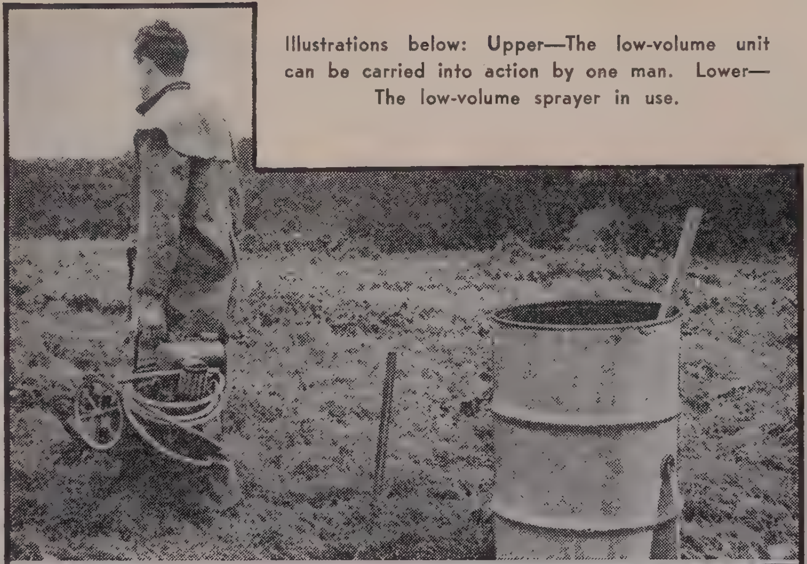
The low-volume unit operates with a ½ h.p. motor at 50 to 60lb. pressure, the spray being applied usually through two low-volume nozzles (46 gauge). The unit is light and can be carried by one man to the water supply or it can be mounted on a tractor with a 44-gallon drum and the tractor driven to the job. The sprayer puts on about 15 gallons per hour, which is much slower than the rate of the larger units, and at this rate the spray can be very efficiently directed on to the bushes. There is practically no water run-off through excess application. A 44-gallon drum lasts 3 hours under normal going with stops for shifting the hose. Light hose is quite suitable and is easy to manipulate. Up to 600ft. can be worked downhill from the pump.

This unit is suitable for properties where the area in gorse is not large and for spraying regrowth before it gets very big after cutting and burning. An acre of regrowth would take about 200 gallons of spray, in which there would be about 1 gallon of 2,4,5-T. The operation would take about 16 hours at a cost of £11 per acre, being £4 10s. for hormone, £6 for labour, and the balance for incidental expenses.

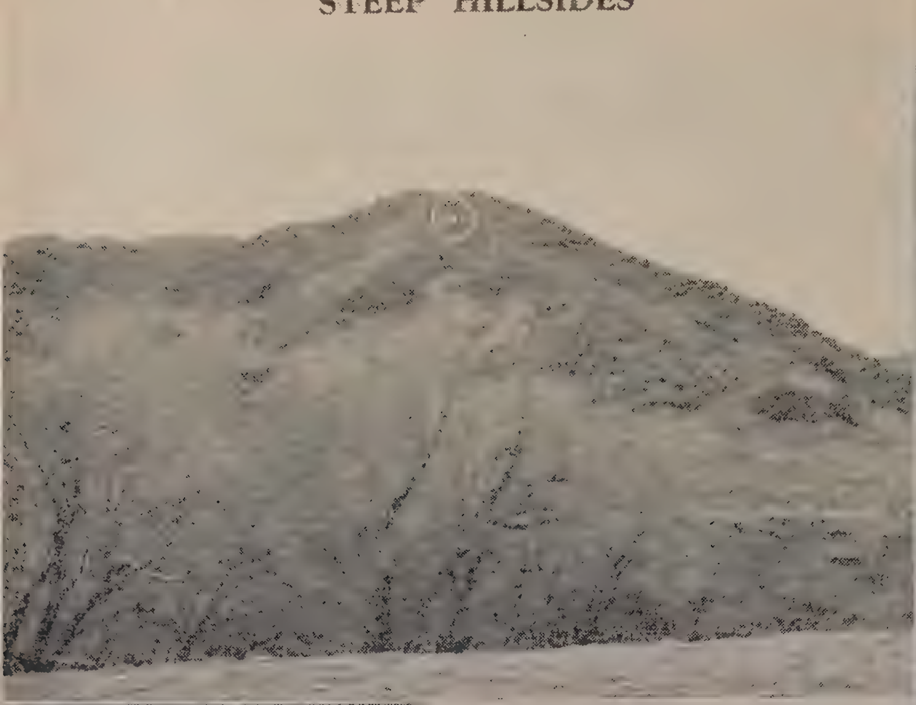
Intermediate Unit

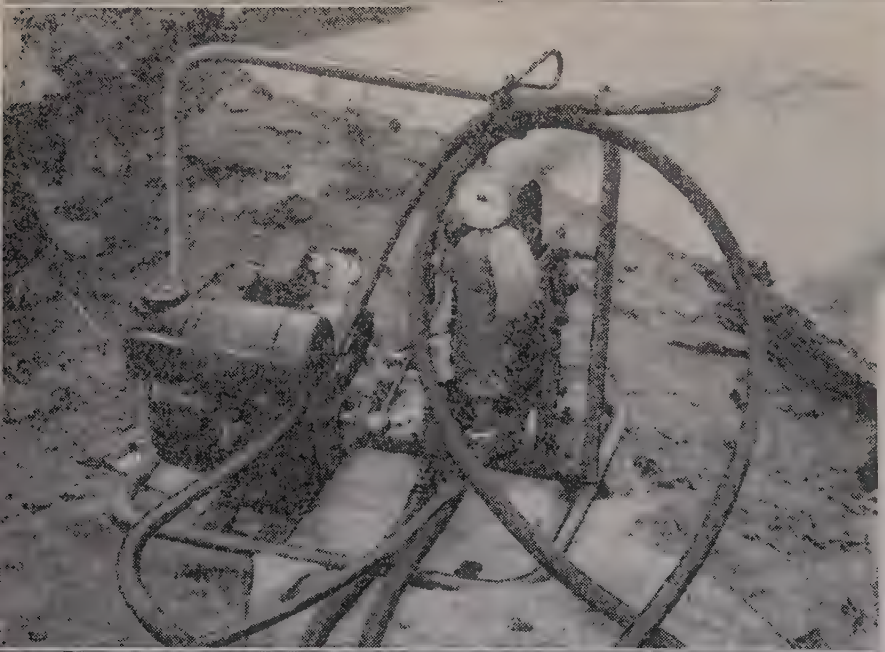
The intermediate unit has a 1 h.p. motor which is capable of generating 250lb. of pressure. Without hoses it weighs 84lb., a weight which two men can carry around the hills. The spraying attachments are the same as with the larger unit, except that the first section of hose from the motor is lighter; a 2-ply, oil-resistant hose is sufficient. A convenient way of operating the unit is to place three 44-gallon drums on the hill above the gorse to be treated and pump the water up to them. It is better if a

Illustrations below: Upper—The low-volume unit can be carried into action by one man. Lower—The low-volume sprayer in use.



SPRAYING OPERATIONS ON STEEP HILLSIDES





Upper left—The water is pumped from the creek up to a 44-gallon drum (in circle) on the hillside. Upper right—Two men can carry the 1 h.p. pumping unit on the hills. Middle left—It is better to have a second motor for pumping from the creek (note the filter on the tube). Lower left—Using a spray gun. Lower right—A pump being used to deliver spray from the drum on the hillside.

Two workmen with spray guns working from a tank and pump on a trailer.

second motor is used to do the pumping, because this allows the sprayer to be kept going continuously. With this set-up the sprayer operates from the first drum while the hormone is being mixed in the second and the third is filling. If a second pump is not used, the spraying unit has to be used to pump the water up to the drums and then taken up to the job. This does not lead to optimum use of labour and also requires the use of more drums if frequent trips to replenish the water supply are to be avoided.

The operator doing the mixing and looking after the drums has free time in which he can assist with the shifting of the hose so that the spray gun is kept fully utilised. It is very desirable to have the unit above the gorse to be treated, because the hose is much easier to manipulate downhill. The unit puts on up to 100 gallons of material per hour and it takes about 5 hours to do an acre of fairly thick regrowth gorse. The cost per acre would be about £9 5s., of which £5 would be for hormone, £3 15s. for labour, and 10s. for petrol and engine overhead.

The chief points of difference between this and the large unit are that two spray guns cannot be operated off it and it cannot be used to spray any great distance up-hill. However, the need to spray up-hill is not likely to arise, because the water can always be pumped up above the gorse. It is a very convenient unit for the average holding, because it can be carried into position by two men and this does away with the necessity of making access tracks.

Large Power Unit

The large power unit has a 2½ h.p. motor capable of generating 400lb. of pressure without being overloaded. This motor without hoses weighs about 220lb., which is too heavy to carry around the hills by hand and therefore it has to be mounted on a tractor or trailer. This entails the making of tracks handy to the gorse. A 3-ply, oil-resistant hose is used in the section attached to the motor, as a lighter-gauge hose is inclined to snake under the pressure. A Y coupling gives two leads of hose. The Y coupling is pegged to the ground to stop movement and undue strain on the join. Beyond the Y join 2-ply hose is used, because the pressure is less and the lighter hose is easier to work with.

The unit, which operates at a pressure of 150 to 200lb. at the nozzle, can put on up to 180 gallons of spray per hour when two spray guns are used. The spray gun, which can be automatically altered to give a fine or coarse spray, is fitted with 5 nozzles and has a spraying range of up to 20ft. A by-pass valve on the pump comes into play when the spray gun is switched off. The unit can operate up to 500ft. up-hill above the pump when one spray gun only is used; 1lb. of pressure is lost for every 2ft. of ascent. The distance the unit can spray downhill is limited only by the length of hose that can be handled. Usually 600ft. of hose is the maximum that can be managed efficiently.

Experience and judgment are needed in operating the spray gun to cover the gorse bush adequately without having a lot of spray running on to the ground, as any semblance of "drowning" the gorse is very wasteful of material. It is impossible to avoid a certain amount of run-off, but care should be taken to see that it is kept to a minimum.

With the large unit an area of gorse can be sprayed more speedily, as it is possible to operate two spray guns. It is suitable for the larger hill-country holdings, where there are generally two men on hand to give maximum utilisation of the equipment. This applies particularly where the country is steep and elevated and where there is a lot of gorse on the property.

As previously stated, access tracks are necessary. It takes two men about 4 hours to spray an acre of fairly thick gorse. This allows for carting the water to the job and fitting up the hoses. Thick regrowth would require

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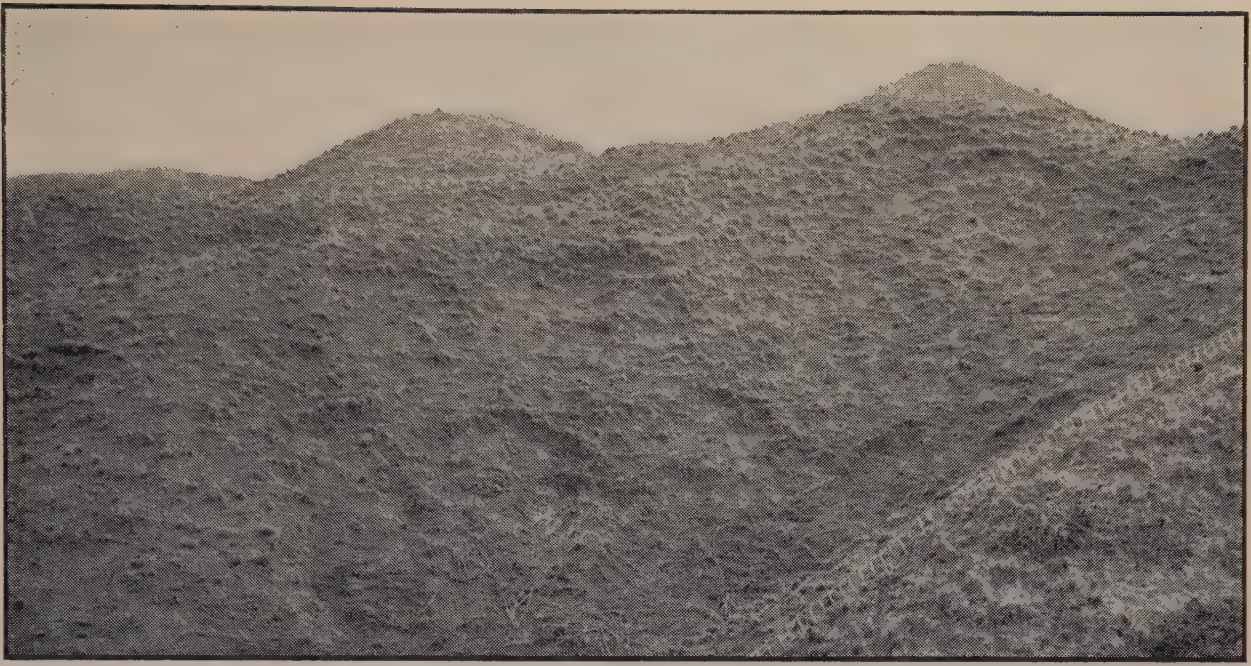


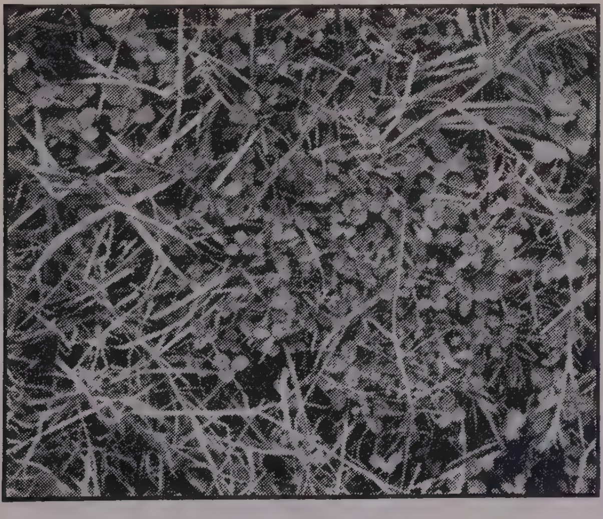
An area of sprayed regrowth gorse. Regrowth gorse is most efficiently controlled with 2,4,5-T hormone.

400 gallons of water (in which there would be 1 gallon of 2,4,5-T) to the acre. The cost would approximate £9 10s. an acre, of which £5 would be for hormone, £3 for labour, and the balance for tractor and plant overhead. Labour is computed at 7s. 6d. an hour, and 2,4,5-T hormone costs approximately £5 a gallon in 44-gallon drums.

Good Cover Essential

It is necessary to get a complete cover of the foliage of each gorse bush with spray to ensure a kill. It is not possible to achieve this on every bush, but the aim is to get as close to this as possible so that a minimum of respraying will be required. The operator needs a good sense of direction to avoid going over the same ground twice at the expense of missing other patches altogether. When he is working in high regrowth it is an advantage to put in tall stakes to mark off the area into squares or rectangles, one marked area being completed before work on another is begun.

When dealing with smaller regrowth some operators prefer to put a colouring agent in the water (a heaped dessertspoon of methylene blue to 44 gallons, costing about 8s. per acre) to define more clearly the areas that have been done.



Gorse land is capable of growing good pasture.

Seed Mixtures for Burnt Areas

Gorse land is capable of growing good pasture and it should be sown with a suitable seed mixture at a fairly heavy rate per acre. Ryegrasses should form a substantial part of the mixture, because they are quick establishing, an important feature when seedling gorse is being dealt with. The aim is to get a thick pasture in as short a time as possible, and, having got it, to keep it by good management and adequate topdressing. Stocking with heavy cattle in wet weather should be avoided, because their skid marks let light into the ground and allow dormant gorse seed to germinate. A mixture which has been found suitable for establishing cover on gorse burns in the Wanganui district is as follows:—

	lb. per acre
Permanent pasture perennial ryegrasses	20
Standard short-rotation ryegrasses	8
Crested dogstail	4
Yorkshire fog	4
Permanent pasture white clover	3
	39

Subterranean clover at 3lb. per acre can be included on sunny locations on light soil types and *Lotus major* at ½lb. per acre can be added on the wetter aspects.

In the subsequent spraying of the regrowth gorse with 2,4,5-T hormone, which is the severest hormone on clovers, at least a proportion of the clover will be killed. To make good this loss the clover is oversown again in the autumn after the spraying.

In the next decade the area of gorse should be considerably reduced provided the initial work is followed up and the regrowth is dealt with as it appears. It must be emphasised that the old maxim of not biting off more than one can chew still applies in gorse control, a later interpretation of it being "Don't burn off more than one can spray".

Acknowledgment

Acknowledgment is made to Messrs. Melville Brothers, Mangamahu, E. Feist, Brunswick, and W. K. Burtt, Wanganui, without whose assistance this article could not have been written.

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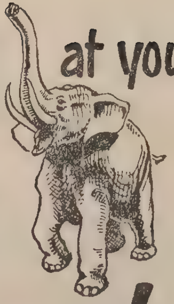

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4th	3.94	4.59	5.25
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Copper Deficiency in Cattle and Sheep

By I. J. CUNNINGHAM, Superintendent,
Department of Agriculture's Animal
Research Station, Wallaceville

COPPER deficiency in New Zealand was first recognised about 1940, causing unthriftiness, low production, and disease in cattle and sheep pastured on reclaimed swamp lands. Soon it was learnt that copper deficiency was not always the full story, for in some areas molybdenum also came into the picture. An excess of this element, especially when associated with a low supply of copper, was responsible for some of the disease symptoms. On peat lands therefore two disease states were recognised: the first, a straightforward deficiency of copper and, the second, a copper deficiency accompanied by poisoning due to excess of molybdenum in the grass.

FURTHER work has shown that copper deficiency with or without molybdenum poisoning is not confined to peat soils. Sandy soils, marine and alluvial silts, and other soils listed below are also affected. At present about 1½ million acres of farmed land are known to be involved and about an equal area not yet developed is regarded as likely to prove deficient. Even this is only an interim assessment, as new soil types and new areas of deficiency are being recognised as work proceeds.

Affected Soils

The practice adopted in defining deficient areas is to use the soil type as a basis. When copper deficiency in animals is found, the soil type on which the animals have been kept is investigated further by studies of stock health and of copper and molybdenum contents of animal tissues and pastures from other farms on the same soil type. In addition information is available from time to time from the Soil Survey Division of the Department of Scientific and Industrial Research on the amounts of copper in the various soil types being investigated. By combining all available information it is possible to decide that certain soil types are affected. A soil map, which shows the distribution of soil types, can then be used to define the areas where disease symptoms might occur. The following list gives present knowledge of soil types that are deficient in copper.

In North and South Islands

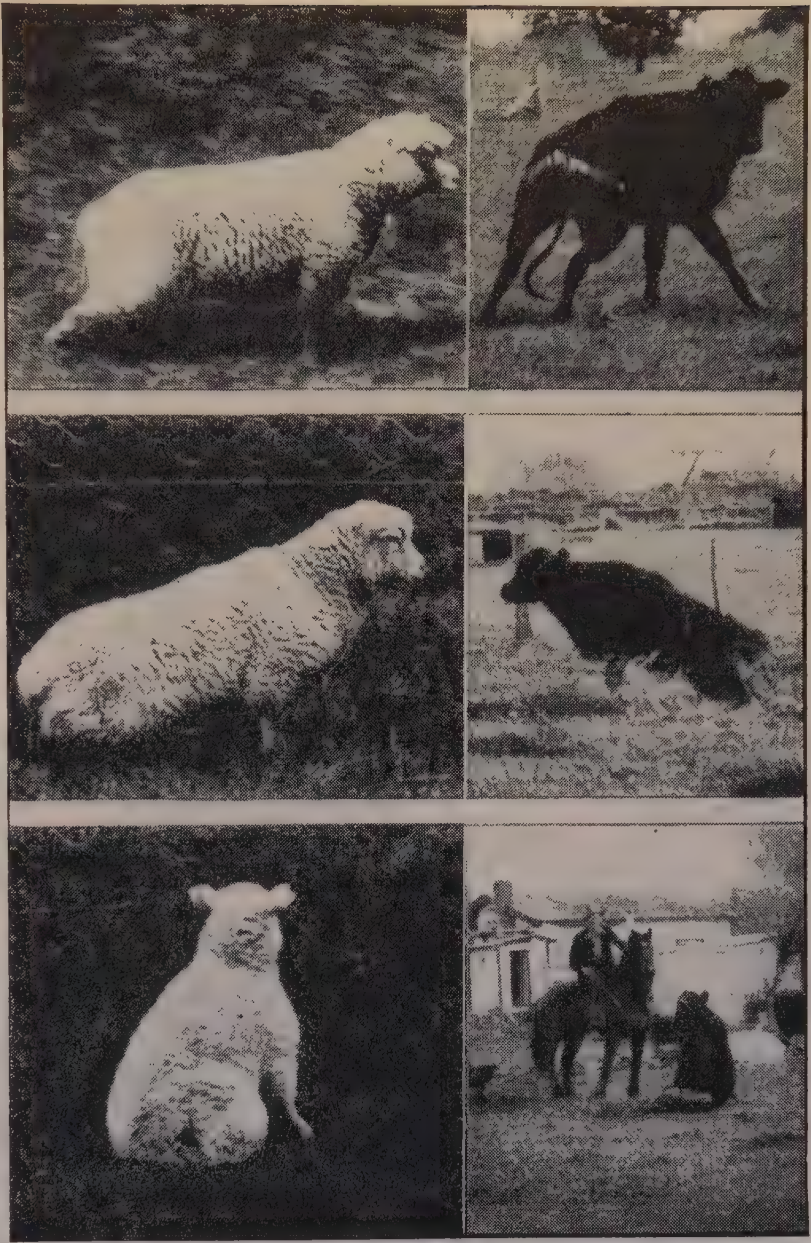
All peat soils and mixtures of peat and sand or peat and pumice.

North Island

Soil type no.		Name
23	..	Patea sand
23 b	..	Whananaki sand
24	..	Hohura sand
24 H	..	Hohura hill soils
45 H	..	Waikau hill soils
47	..	Wharekohe silt loam
47 d	..	Te Kopuru sand
47 dH	..	Te Kopuru hill soils
73 b	..	Torehape complex

South Island

Omihi clay loam
Onepunga sandy loam
Willowbridge silt loam and sandy loam
Glasnevin stony sandy loam



Typical attitudes in an ataxic lamb and an ataxic heifer.

Distinction into soils where copper deficiency occurs alone or where it is associated with molybdenum poisoning is not yet finished, and only a general statement can be made. On most of the sand and on a small area of peat near Waitakaruru there is a simple copper deficiency; on the remaining soils mentioned, which include most of the peat soils, excess molybdenum is associated with the copper deficiency. Still more recent work is showing that some of the volcanic ash soils of the North Island not included in the list produce pastures with a sufficiently high concentration of molybdenum to affect health of cattle.

The deficient soils mentioned are so widely distributed over New Zealand that a concise statement of the localities affected cannot be given. The peat soils and coastal sands can be easily recognised; the other soils can be located by interested farmers from discussion with Instructors in Agriculture and other field officers of the Department of Agriculture.

Symptoms in Cattle

Copper Deficiency

The main symptoms of copper deficiency in cattle are retarded growth and unthriftiness. Calves grow more

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slowly than normal and reach adult size later than usual. There are rare cases of ataxia in young calves similar to that which will be described for sheep and, as with sheep, the condition, once developed, cannot be cured. Typical attitudes in an ataxic heifer and a lamb are shown on page 369.

Adult cattle are poor conditioned and have thin, watery blood. The coat colour of some red animals changes to a bleached yellowish-red.

Copper Deficiency with Excess Molybdenum

On peat land the disease of copper deficiency with excess molybdenum has appropriately been named "peat scours", since the most characteristic symptom is persistent, severe, debilitating scouring, which affects all breeds. Scouring occurs whenever there is a flush growth of pasture; in other words, practically every spring, and frequently, though in much less severe form, in the autumn when a dry spell is followed by warm rains. The scour is almost continuous, thin and watery, yellowish green to black, and contains numerous small bubbles. Typical cases of peat scours are shown in the lower illustration on this page and the illustration on page 373.

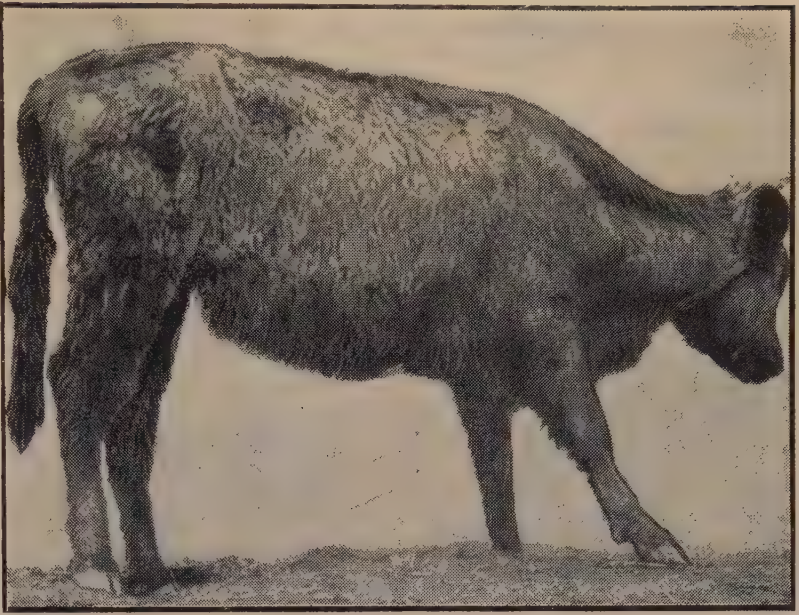
Spring scours persist for several months, occasionally starting as early as July while cattle are dry and still receiving hay, but usually is most marked after calving and during September and October. There is marked loss of condition and production in milking cows and some may die. Bulls are affected, but not to the same degree as cows. About November, when feed hardens, scouring frequently clears up without treatment and cattle improve in condition by December or January. Scouring also ceases if stock are turned out to rough feed or removed to areas of different soil formation.

Young stock are affected even more severely than adults, and in many cases replacements cannot be reared unless weaned calves are sent away to areas of different soil type. Calves which are reared on copper-deficient country develop poorly, and as yearlings or 2-year-olds they are much smaller than is normal for their breed. Scouring is in the most acute stage during the winter and spring when the animals reach yearling stage and many deaths occur. Yearlings are more than usually susceptible to infestation by internal parasites, and this undoubtedly contributes to the difficulties in rearing them.

On some areas, marked bone fragility occurs in calves from about 3 months old onward. A slight knock is sufficient to cause fractures.

Beef cattle do not scour so severely as dairy cattle and seasonal loss of condition is not so marked.

On soils other than peat the scouring symptoms are less prominent, probably because the ratio of molybdenum to copper is not so high. In these cases the most prominent features are unthriftiness and slow growth of young cattle over the first 2 to 3 years and, in black cattle, a marked change of coat colour to a mousy grey. Sometimes the change occurs only in hair round the eyes; in more severe cases the whole of the body coat is affected. The upper illustration on this page shows the grey coat that occurs in black cattle grazed on pastures high in molybdenum.



Grey coat of an Aberdeen Angus yearling on pastures high in molybdenum.

Symptoms in Sheep

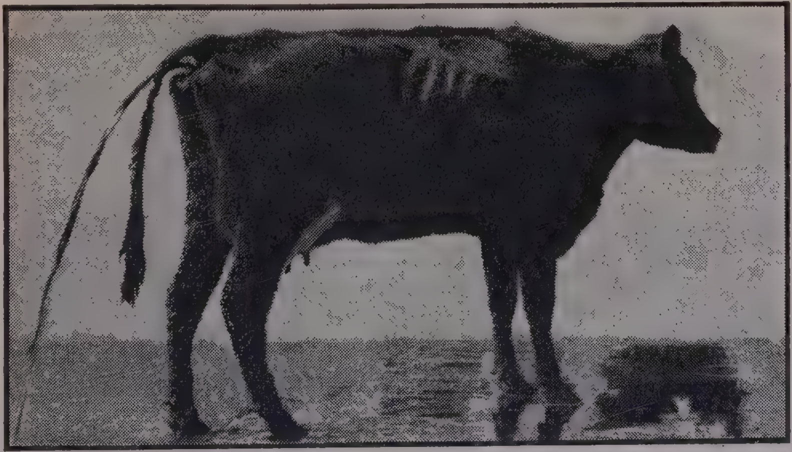
No differences have been noted in the diseases that occur in sheep on land deficient in copper or with this deficiency accompanied by excess molybdenum.

Adult sheep of either sex are healthy despite long periods on deficient pasture.

If ewes are brought in fresh each year from normal country, they can produce and rear normal lambs. From a small percentage of ewes two crops of normal lambs can be taken in successive seasons. If, however, ewes are kept longer on deficient country or are reared there, the tendency is for their lambs to have fragile bones or to become affected by inability to walk normally (enzootic ataxia). Bone fragility appears to be the earlier manifestation and ataxia occurs if the deficiency has been more severe or more prolonged.

Some of the lambs may die or be ataxic at or near birth, and this is the more severe form of copper deficiency. In most of the cases in New Zealand a less severe type occurs in which some of the lambs become affected at the age of 2 to 4 months. Occasionally all four limbs are involved and the lamb cannot walk. Most commonly the hind limbs are affected and the gait becomes inco-ordinated, so that the rump sways from side to side when the lamb attempts to walk. The amplitude of the swaying may increase so that the lamb swings round and the rump drops to the ground, in the posture of a dog sitting. Typical attitudes are shown on page 369.

The condition may be latent and develop only after exercise; it may



In peat scours in cattle the most characteristic symptom is persistent, severe, debilitating scouring.

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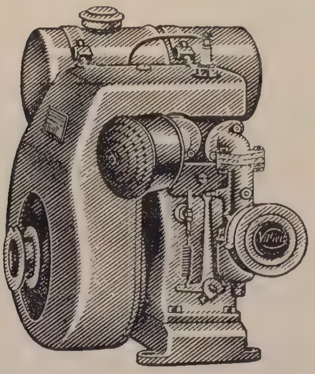

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be of such degree that the lamb can move, but always with a wobbly, swaying gait; or it may be so severe that walking is impossible. Provided the lambs can move about, they will feed and grow and eventually some even fatten. Lambs which are unable to move about to collect food will, of course, die from starvation.

Evidence for Copper Deficiency and Molybdenum Excess

The evidence for copper deficiency is the presence of less than normal amounts of copper in the pastures and in the bloods and livers of animals that have been on the affected country for some time.

Evidence that excess of molybdenum plays a part is the presence of unusually high amounts of molybdenum in pasture, and the production of characteristic symptoms experimentally by increasing molybdenum intake on areas where these symptoms are not normally encountered.

Copper and Molybdenum in Pasture

Normal pasture contains between 10 and 15 parts of copper and under 2 parts of molybdenum in every million parts of dried grass. Pastures from the areas where copper deficiency alone occurs have from 1 to 4 parts per million (p.p.m.) of copper and ½ to 2 p.p.m. of molybdenum. Where excess molybdenum is a factor the copper varies from 3 to 7 p.p.m. and the molybdenum from 4 to 20 p.p.m.

Copper in Bloods and Livers

Figures that illustrate the low values that occur for bloods and livers are given in Table 1.

TABLE I—COPPER IN BLOODS AND LIVERS

	Cattle			Sheep		
	Bobby calf livers	Adult		Lamb livers	Adult	
		Livers	Blood		Livers	Blood
Normal	360	200	0.1	250	400	0.1
Copper deficient		5 to 10		5 to 10	20	0.02
Copper deficient and excess molybdenum	55	10	0.05	5 to 10		

The liver values are given as parts of copper per million parts of dried liver; the blood values as milligrams of copper per 100 millilitres of blood or approximate parts per 100,000 of fresh blood. These low figures for liver and blood are clear evidence of deficiency in the animal and indicate a deficient supply in the food or the presence of some factor preventing the use of copper from the food.

Effect of Molybdenum

Some comment on the interaction of copper and molybdenum is here appropriate to precede the reasons for inferring that scouring is due to the extra molybdenum in the pasture.

It is known that copper and molybdenum act against each other inside the animal. An excess of molybdenum in the ration tends to drive out stored copper and to interfere with the use that can be made of the copper present. On the other hand extra copper in the diet will, within limits, neutralise the effect of excess molybdenum. The position is even more complex, for Australian workers have recently shown that sulphate, in its turn, affects molybdenum storage in the body and if sufficient sulphate is present, molybdenum is got rid of quickly.

In a part of Somerset, England, a disease called "teart" occurs, of which the important symptom is scouring of the same character as that of peat scours. This symptom was shown to be due to an excessive amount of molybdenum in the grass, in which its concentration sometimes reached 60 p.p.m. Daily feeding of copper prevented this scouring.

The position in New Zealand is parallel to that of teart, but differs in two important aspects. Here scouring is seasonal and it results from a lower amount of molybdenum in the grass. The seasonal effect is accountable by the great seasonal variation in molybdenum content of the grass. On some farms the molybdenum reaches 16 to 20 p.p.m. between June and September and falls to about 7 p.p.m. from November to April. There are similar variations on other farms, but the maximum is not so high.

The lower levels of molybdenum can produce scouring if the copper in the pasture is below normal; the lower the copper content is the smaller is the amount of molybdenum necessary to cause scouring. Conversely, the higher the copper content of the pasture is the higher must molybdenum figures reach for poisoning to occur. This has been proved both ways by raising the copper content of pasture from topdressing with bluestone and thereby preventing scouring, and by raising the molybdenum content by topdressing with molybdate compounds and inducing scouring.

Animals that have been brought off normal land are resistant for a period, because they carry in their bodies stored copper that protects them. After a period that varies with the amount of stored copper and the relative levels of copper and molybdenum they meet in the new environment they succumb to scouring. In the intervening period molybdenum from the new feed washes out the stored copper and then renders them susceptible.

Sheep have not been found to scour on farms where cattle scouring occurs, nor has it been possible to induce scouring by dosing with molybdenum or running sheep on grass topdressed with molybdenum. However, a high intake of molybdenum by sheep, as with cattle, reduces stores of copper and particularly inhibits the passage of copper from the mother to the unborn lamb. Thus sheep on pastures with a high molybdenum content are likely to produce lambs with a low liver copper content; that is, lambs susceptible to ataxia.

Treatment and Prevention of the Diseases

For copper deficiency with or without excess molybdenum the method of treatment or prevention is to increase the copper supply.

Prevention should be the objective and is the only method that gives results against enzootic ataxia. The scouring symptoms of peat scours can be removed by a short course of dosing with copper solutions, but unless a regular supply of copper is given throughout the year, thrift and production will not be improved.

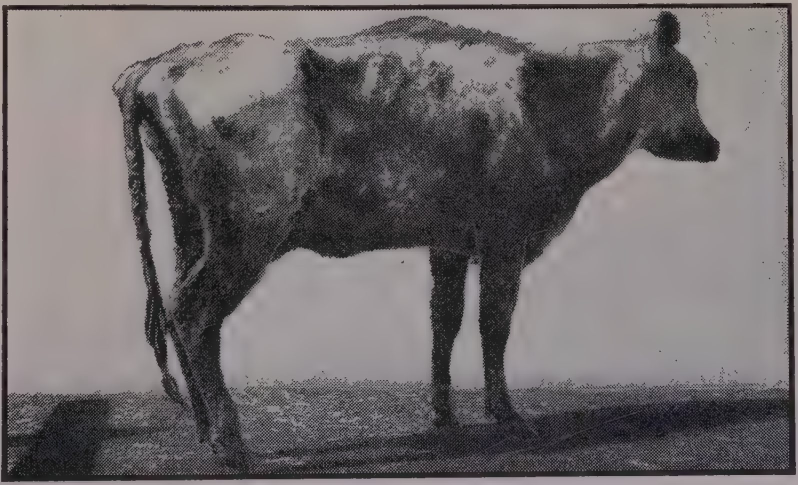
Cattle

The object is to supply regularly approximately 1oz. of copper sulphate (bluestone) per week for every 8 adult animals. The amounts for young stock should be reduced in approximately the ratio of their body-weights to that of adults.

Copper can be supplied by:—

(a) Drenching bluestone solutions.

(b) Addition of bluestone to the drinking water, or spraying copper solutions on hay.



A typical case of peat scours in cattle.

(c) Licks.

(d) Topdressing the pastures with bluestone.

(a) **Drenching** is suitable for treatment of acute cases, but is too laborious for an all-the-year-round routine.

The drench is prepared by dissolving 1oz. of bluestone in 1 gallon of water and giving 1 pint for each drench. If this drench is given at 2-day intervals, acute scouring in peat scours should clear up after 1 to 3 drenches. If scouring does not cease after 5 drenches, there is some cause other than copper deficiency.

Though a course of treatment will remove the acute disease symptoms, it will not relieve the copper deficiency. To do this a drench each week throughout the year would be necessary and this is not an economic method.

(b) **Addition of bluestone to drinking water:** This is satisfactory if troughs are of concrete and there is no contact of water containing bluestone with galvanised pipes or fittings. The zinc of such fittings is dissolved and the copper deposited. Additions of bluestone should be worked out to provide 1oz. for each 8 adults.

The disadvantage is that all animals do not get the correct amount.

Bluestone solutions may also be sprayed on hay and this method is effective during the hay feeding period if carried out regularly to give 1oz. of bluestone per week to each 8 adults.

(c) **Licks:** For cattle, licks that are a mixture of salt and bluestone should contain 1½ to 2 per cent. of bluestone. If substances like molasses are added to increase palatability, the lick should have only 1 per cent. of bluestone to keep the total copper intake down to the correct level.

Licks will control copper deficiency, but the disadvantages are that not all stock take them, that licks might not be put out regularly, and that cost is appreciable.

Care should also be taken that sheep do not eat cattle licks, as sheep are poisoned by copper if they eat too much for a long period. The lick for sheep should contain not more than ½ per cent. of bluestone in salt or ¼ per cent. of bluestone in salt containing molasses or other substance that increases palatability of the lick.

(d) **Topdressing:** This is the most satisfactory and effective method of control. Five pounds of bluestone per acre should be applied each autumn. The bluestone can be mixed with any of the ordinary fertilisers. Copperised superphosphate, which is now available ready mixed, can be purchased instead of ordinary superphosphate. Its use at 2cwt. per acre provides the necessary amount of copper with no labour of mixing on the farm.

The whole farm should be topdressed each autumn for full effect. Experimental work has shown that on sandy soils as well as on peat soils the response in copper content of the pasture to 5lb. of bluestone per acre annually is sufficient to keep stock healthy.

Sheep

Enzootic ataxia in lambs cannot be cured and preventive measures are the only ones satisfactory. Copper should be given to the ewe before lambing. This can be done by regular drenching, by providing licks, or by annual topdressing of pastures.

Drenching: This is not a procedure that is likely to be attractive, because of labour requirements and difficulty in handling pregnant ewes. Special circumstances may make it necessary. The minimum number of drenches known to be effective is five, given between tupping and lambing. The drench should be made up by dissolving 1oz. of bluestone per pint of water and drenching 1oz. of the solution at intervals of about 3 weeks.

Free Bulletins on Troubles of Sheep and Cattle

Nos.

180 Cobalt Deficiency in Sheep and Cattle.

189 Control of Internal Parasites by Phenothiazine.

192 Blowfly Strike in Sheep.

245 Parasitic Lesions of Lamb Livers.

248 Liver-fluke of Sheep and Cattle.

278 Prevention of Hydatids.

312 Penicillin for Treatment of Mastitis.

323 Stock Losses from Transit Tetany.

325 Foot-rot in Sheep can be Eradicated.

328 Foot Troubles in Farm Animals.

348 Lambing Troubles.

The above bulletins, part of a series of over 350 on all aspects of farming, are available post free from the nearest office of the Department of Agriculture, or from the Head Office of the Department, Box 2298, Wellington.

Licks: Licks are effective provided sheep eat the lick regularly. The object is to have 100 sheep eat 1oz. of bluestone each week. This would be achieved if each sheep eats 2oz. per week of a lick containing ½ per cent. of bluestone.

Sheep are very susceptible to copper poisoning and deaths will result if they take a lick of too high copper content over a long period. The maximum safe levels of bluestone in licks for sheep are ½ per cent. in plain salt and ¼ per cent. if substances like molasses are added to increase the amounts eaten.

Topdressing: For sheep, as for cattle, topdressing is the safest and most effective method to control copper deficiency. The same rates of topdressing apply.

Elimination of ataxia by annual replacement of ewes: Ewes brought in from country that is of normal copper content have sufficient copper in their livers to carry them over at least the first lambing. This is a method that can be used to avoid ataxic lambs where difficulties in supplying copper are great. The carry-over of copper explains why farmers on copper-deficient land who replace their ewes regularly do not have ataxia in their lambs.

Results of Applying Preventive Measures

Improved growth-rate of young animals, better condition of all stock, and improved production of flesh and milk follow the application of control methods where cattle are concerned.

In New Zealand, sheep have been found to show only one effect from the degree of copper deficiency to which they are exposed, and that is the occurrence of ataxia in young lambs. Even ewes bred on deficient farms and which themselves lose lambs from ataxia, that is, ewes with greatest chance of being deficient, are well grown and healthy. Unaffected lambs from flocks where a number are lost with ataxia also grow well and kill out well at the works. Lambs on the same area fed copper have not grown at a faster rate except on two properties, one in Hastings and one in North Canterbury. The increased growth-rate in each of these cases was very small. Further work is constantly going on and this may alter the story. The present indication is that control measures on sheep farms will prevent ataxia, but improved growth in sheep or lambs is not to be expected.

Copper deficiency causes deterioration in wool quality. Crimp is lost and a straight wool with less character is produced. Supplying of copper corrects this. In New Zealand the Merino is the only breed in which an effect on wool has so far been noted, though overseas workers have observed similar effects in British breeds. Occurrence in New Zealand is being watched for and cases of defective wool are of interest and should be reported to Livestock Instructors or Government Veterinarians. The most certain way to determine if the defect is due to copper deficiency is to drench sheep every fortnight with 1/20oz. of bluestone (1oz. of solution of 1oz. of bluestone in 1 pint of water) for 2 months and observe whether there is any change in the new-grown wool.

Indications for Use of Copper

The possibility of copper deficiency should be considered for farms of any of the soil types mentioned. This list is not exhaustive and new types may be added.

The health of stock is a good guide and copper may be needed:—

1. If lambs develop ataxia.
2. If calves from beef cattle are unexplainedly poor and grow slowly.
3. If black cattle become grey.
4. If dairy calves do not grow despite good husbandry.
5. If dairy cattle scour in spring and if production is low.

Government and Club Veterinarians and Livestock Instructors of the Department of Agriculture can give advice and assistance and, if necessary, can obtain livers or samples of pasture to confirm suspected cases of deficiency.

◆

Farm Maintenance Work at Approach of Winter

By D. F. SCOTT, Machinery Instructor,
Department of Agriculture, Auckland

THE general easing of other work at the approach of winter will allow attention to be given to certain necessary autumn jobs. Careful attention to these before the worst of the winter comes will give worthwhile results later.

DRAIN cleaning could be considered one of the least mechanised of routine farm jobs and means many weary hours spent with shovel, drag, and side knife. In the past one of the reasons against the mechanisation of drain cleaning has been the wide variation in drain sizes. However, recently some new machines have been introduced and several of them look very promising. Two are adaptations of the popular hydraulic shovel and the other cleans with a revolving chain carrying scrapers. The first two can be used for digging as well as cleaning, but the third is a cleaner only. Whether drains are cleaned by hand or machine, the main thing is that they should be free from weed growth or silting so that they may do their work efficiently through winter.

Tracks and Gateways

Steps can be taken to reduce pugging and the almost inevitable mud in gateways and on races used by stock and other traffic. Before winter sets in gateways should be built up, preferably with hard filling, to prevent water lying in hollows and wheel marks, and races should be metalled and graded to a camber and a water-table at either side.

In some areas where metal for races is too expensive narrow concrete lanes have been used successfully. These lanes are 18in. to 20in. wide and cows can move along in single file. To prevent damage to the edges the lanes are laid so that the surface is about level with the surrounding ground.

Hill Country Tracks

Maintenance of hill country tracks largely involves water and erosion control, the main problem being to prevent water running down tracks in sufficient quantities or fast enough to cause scouring.

Culverts should be spaced to collect water from the water-table and run it out under the track. A track should always climb slightly at the side of a creek bed or during flooding the creek could be deflected down the track with disastrous results. It is a good idea to build slight ridges across the tracks with turves. They need only be an inch or so in height and tend to spread water and prevent it channelling.

The planting of poplar and willow trees both above and below the track will help to stabilise banks and every effort should be made to establish and maintain a thick turf on the surface, as this is one of the best aids in preventing water damage. To prevent the accumulation of water on tracks some farmers grade them with a slight fall to the outside. This could be dangerous, however, if the tracks are used under slippery conditions.

Gateways and races should be attended to before winter sets in. Gateways should be built up, preferably with hard filling, to prevent water lying in hollows and wheel marks. Races should be metalled and graded to a camber and a water-table at either side. Narrow concrete lanes have been used successfully in some areas where metal for races is too expensive. The lanes are 18in. to 20in. wide and are laid so that the surface is about level with the surrounding ground to prevent damage to the edges.

Fences

Attention to fences must be included in the list of winter maintenance work. Where many new posts are required a power-driven post-hole digger is worth while. Fences should be checked for loose battens, slack wires, and faulty posts. The saying that "a stitch in times saves nine" applies equally to fencing as it does to other repair work.

Electric fences, though their main use is of a temporary nature for grazing control, deserve regular attention. Insulators, especially those made from rubber tubing, should be inspected and if the surface is perished or cracked, should be replaced. Poor insulators allow considerable leakage and reduce the efficiency of the unit. Electric fence batteries while in use should be regularly checked for water level, and, if low, should be topped up with distilled water to cover the plates by about ½in. When not in use batteries should be given a charge about once a month and also checked for water level. The addition of distilled water is intended to replace water lost by evaporation but not by spilling. If a battery is overturned and loses liquid, it should be refilled by a serviceman who should be told of the spilling of the liquid.

Overwintering of Domestic Bee Colonies

Seasonal Notes for the Domestic Beekeeper

WITH the conclusion of the honey flow attention must now be given to ensuring the comfort of bee colonies so that they may survive the winter. A considerable number of bee colonies either die out in winter or emerge from it in a very weakened condition. Correct management during autumn is of great importance and will ultimately play a large part in determining the following season's honey crop. In this article T. P. J. Williams, Apiary Instructor, Department of Agriculture, Hamilton, discusses the requirements for the successful wintering of bee colonies.

HONEY bees are not able to hibernate as do solitary insects, and they cannot migrate to warmer climates. The queen and almost all of about 30,000 worker bees must survive winter together if the colony is to make normal progress in spring. The bees must group together to form a cluster, filling the spaces between the combs until they become a compact, spherical mass. The bees on the outside of the cluster form an insulating shell from 1in. to 3in. deep and the bees within, which are in loose formation, generate the heat through metabolic processes. A temperature is produced within that permits heat to be conducted to the bees on the surface of the cluster, where they can live at a body temperature as low as 43 degrees F., provided they are kept supplied with honey by the bees from within. If the outside temperature falls, the cluster draws together, reducing its size; this thereby reduces the surface exposed to heat radiation and allows more bees within to generate heat. On the other hand, if the air temperature rises, the cluster will expand.

The chief requirements for the successful wintering of colonies are an adequate supply of honey and pollen, a young, vigorous queen, and a good strength of young bees. Hives should be protected from prevailing winds with hive material that is close fitting and rainproof. As bees are very susceptible to damp conditions, it is very important to see that all colonies are kept as dry as possible. All grass or growth around the hives and especially at the entrances should therefore be cleared away. Where flat lids are used hive mats should be removed to enable hives to keep dry throughout winter. Where mats are left on, care should be taken that no parts overlap the edges; otherwise they will draw the moisture in wet weather. It is a sound idea to cut the mat smaller than that required to cover the super, so that there is about a 1in. to 2in. gap on all sides. This allows air to pass over the top of the mat, for in poorly ventilated hives the atmosphere may become so laden with water vapour that water will condense on all parts of the hive. The source of this moisture is, of course, the food of the bees. Honey is a carbohydrate and when consumed by the bees ultimately becomes carbon dioxide and water. Unless this moisture is carried off in the form of vapour by correct ventilation, it will be condensed in the hive.

Colonies appear to winter best in two full-depth boxes, so it is necessary to remove all surplus supers above the second box. Sufficient empty comb room should be left in the middle of the brood nest to allow space for the queen to continue brood rearing and for the bees to cluster comfortably. It may be advisable to contract hive entrances in some districts. However, this does not appear necessary in North Island districts, though the entrance should be no more than ¼in. deep.

A close examination should be made of all brood for the presence of American foul-brood disease. Any cappings which appear dark or sunken should be removed and the larvae tested for disease.

Winter Feed

Each colony should be allowed 50lb. of well-ripened honey to sustain it through winter and early spring. Some districts require less, but it always pays to err on the right side. Many beekeepers fail to provide a margin of safety and eventually lose a year's crop of honey through leaving the colony a few pounds short. A full-depth comb will contain about 5lb. of honey when completely sealed, so that the weight of honey may be gauged fairly accurately. Where sufficient honey is not available the shortage may be supplemented by feeding a heavy solution of sugar syrup. In most areas there is an abundance of pollen, but it would be advisable to check the combs, for the hive will require at least the equivalent of two full combs of pollen.

This domestic apiary is sheltered from cold draughts and winds and receives maximum sunlight.

Colonies below Strength

It is not advisable to winter very weak colonies, as they do not build up sufficient strength during spring to be able to take advantage of the honey flow. They result usually from poor queens or restricted brood rearing during summer. They should be united to another colony by the killing of the poorer queen and by the placing of the complete brood nest and the queen and all the bees of the other hive on top, with a sheet of newspaper between the two colonies. The bees chew through the paper and unite peacefully.

Shelter

A frequent mistake made by domestic beekeepers is the placing of hives in the shade of trees or under thick, overhanging hedges. Bees cannot do well under such conditions, for under hedges and trees they often get more cold draughts than if in the open. Bees thrive best where they can get as much sunlight as possible. It is, of course, an advantage to have them sheltered from cold winds, and this can usually be done by placing them far enough away from the shelter to avoid shading.

Storing Combs

The domestic beekeeper usually has a few boxes of combs to be stored away during the off-season. These combs are valuable and should be protected from wax moth and mice. The combs should be sorted into three classes—empty brood combs, those containing pollen, and new combs—and should be stored with no more than eight to the box equally spaced as wide as possible. The first box should be placed on a flat cover with a few crystals of paradichlorobenzene (P.D.B.) placed on a piece of cardboard over the top bars of the frames in districts where wax moth is troublesome. A sheet of newspaper is then placed over the box and the next box placed on top. Crystals are spread on top of this box and then a sheet of paper placed on it. This operation is continued until the tier is completed and a hive lid is then placed on top of the tier. These combs should be inspected regularly and a few more crystals added if necessary. The supers and combs should be thoroughly aired before being used on the hives again; otherwise the flavour of the honey stored in them may be injured.

Care and Cleaning of Milking Machines

By W. G. WHITTLESTONE, Physical Chemist, Department of Agriculture's Animal Research Station, Ruakura

A CLEAN milking machine is important both nationally and to the individual farmer. Nationally, the standard of cleanliness of the machines and methods of 30,000 farmers affects the quality of export products. With increasing competition from margarine, quality must be lifted to the highest possible level. To the individual farmer efficient milking demands a mechanically efficient machine. Many common troubles are caused by poor cleaning methods. The first step toward improvement is therefore the better understanding of the importance of good cleaning methods and regular maintenance of a good cleaning routine. This article describes some of the problems and shows how, with the aid of modern methods, the farmer can make the milking process more reliable and improve the quality of his product. The advice on the cleaning of machines conforms to the procedure now advocated by the Dairy Division of the Department.

MILKSTONE and fat absorption into the rubberware are the two most important by-products of a poorly cleaned machine. Both have a serious effect on the quality of the milk and on the efficiency of the machine.

Milkstone

Milkstone is a deposit consisting of milk solids together with constituents from the water used in washing the plant. When the water is hard the use of caustic soda and soda ash (without the use of special water-softening additions) causes the formation of a fine deposit which will cling to metal surfaces. This may be the beginning of a serious milkstone deposit.

Even with soft water milkstone deposits may form. There are many parts of a milking machine which are not continuously in contact with milk during milking. If a film of milk remains on a surface which is warm due to fresh milk flowing nearby (for example, releaser surfaces, parts of the sight glasses, and parts of the milk pipe), the water from the milk evaporates under vacuum and so leaves a sticky film. Mineral deposits from hard water or fatty films from churned milk will add to this deposit and so cause a hard, tenacious layer to form. One of the problems with milkstone is that only part of it—the milk protein (casein) and the fatty parts—can be removed effectively with an alkaline detergent. The mineral part containing limestone and occasionally iron will only dissolve in acid. Thus for milkstone prevention an acid cleaner should be used at least once a week.

Milkstone occurs on rubber surfaces as well as on metal and glass. It increases the tendency of rubber to crack. It also reduces the efficiency of rubber rings, thus causing leaks. Its worst effects are due, however, to the fact that milkstone deposits harbour bacteria and encourage their rapid growth. Bacteria damage milk quality. The diagram shows the parts of a milking machine where bacteria are to be found in the largest numbers. Except perhaps at the teat-cup mouthpiece and rings, germs are found wherever milkstone has been deposited.

Ruakura research has shown that milkstone can be prevented by the special Ruakura-type acid detergent used once weekly.

Fat Absorption

Rubber tends to absorb fat. In the presence of light this causes rubber to lose many of its important qualities. The parts most affected are the inflations and milk tubes. All the tubes connecting to the claw tend to slip off if they are swollen with fat. This causes endless trouble to the farmer. In addition to absorbing butterfat from the milk, milking machine rubberware can take up grease from udder salves used on hands and teats. Non-greasy preparations used **after** milking will help to reduce this.

Fat absorption troubles at the teat cups are usually fairly apparent and the farmer can take steps to rectify them by replacement or by special treatment.

On the other hand, faults due to this factor may arise which are not easy to detect. Rubber releaser flaps often swell where the rubber works against the metal. This will result in the flap seating badly and so causing leaks. Sometimes a flap closes slowly, causing air to be sucked into the spit or main chambers. This causes violent agitation of the milk in the releaser and spray is carried over to the vacuum tank. In bad cases the releaser may flood, causing sudden changes in the milk pipe vacuum and resultant falling of cups as well as damage to the vacuum pump due to milk passing through it. In other words, swollen releaser flaps causing leaks may be responsible for quite alarming symptoms in the rest of the plant.

Ruakura research has shown that fat absorption can be minimised and effective cleaning obtained by using the special Ruakura type alkaline detergent 6 days a week.

Cleaning the Milking Machine

It is not uncommon to see a farmer go through all the motions of cleaning his plant but neglect to wash the outside of the cups. This omission results in dung and dirt getting into the washing solution and being sucked throughout the machine. Bacteria introduced in this way flourish until the next milking.

Before any cleaning operations are started the cups must be scrubbed in detergent in water as near boiling as possible. Only then should the cups be used to suck the cleaning solutions through the plant.

Recommended Cleaning Schedule Using Alternating Alkaline and Acid Detergents

(Note: Far end and near end of shed refer to position with respect to releaser)

Monday to Saturday

Use alkaline detergent, ¼oz. (1 teaspoon) to a gallon of boiling water.

Sunday

Use acid detergent, ½oz. (2 teaspoons if a powder) to a gallon of boiling water.

Procedure Every Day

1. As last cows are milking and cups become available scrub cups and claws in boiling detergent solution; rinse with hose if available.
2. As soon as last cow finished draw a gallon of warm water through furthest set of cups; allow to run into vat.
3. Divert releaser outlet if milk still in vat and rinse with 2 gallons of cold water per set of cups *starting at releaser end*. Lift cups out of bucket several times.
4. Disconnect releaser breather tube and put 4 gallons of cold water through furthest set of cups. As this goes through withdraw and replace milk pipe end plug at least twice.
5. Wash plant with 1 gallon of boiling detergent solution per set of cups *starting at releaser end*. Lift cups from bucket several times. Use 2 gallons for furthest set of cups. While detergent solution is passing through withdraw milk pipe end plug and release vacuum at least twice. (The hot detergent solution released by vacuum tank may be collected in bucket.)
6. Rinse with 1 gallon of boiling water per set of cups *starting from releaser end*. Lift cups once. Use 2 gallons for furthest set of cups. Withdraw milk pipe end plug twice.
7. Finally, withdraw plugs, take releaser to pieces, take vacuum tank down, hang cups in cool, ventilated place out of sun, and open sight glasses to air. Scrub releaser and vacuum tank with detergent solution, rinse, and leave in sunny place.

WARNING: Acid detergent solutions must not be left standing in a bucket.

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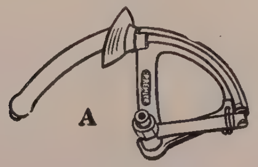

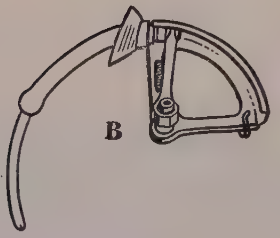

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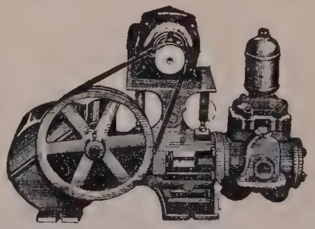

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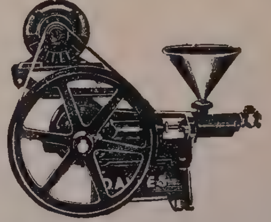

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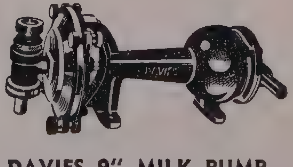

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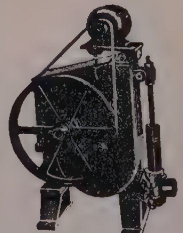

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For an understanding of the problems of cleaning the milking machine certain principles must be clear. In the flushing system of cleaning used in New Zealand the washing liquid is in contact with the machine for a very short time. This means that to get the best action there must be as much agitation of the liquid as possible. This is obtained by lifting the cups in and out of the bucket containing the detergent and by withdrawing and replacing the milk pipe end plug a few times while each rinse is going through.

One of the most important steps which is often neglected is the adequate rinsing of the machine as soon as the last cow is milked. A good practice is to draw a small amount (about a gallon) of warm water through **the set of cups furthest from the releaser** as soon as the last cow goes out. Such a rinse must not be too hot. It should feel comfortable to the hands. This is allowed to run into the vat. This should be followed immediately with at least 2 gallons of cold water through each set of cups, **starting at the releaser end. This latter part is very important.** If this second rinsing is started at the end furthest from the releaser, when the nearest bail is reached the milky water from the dropper runs back along the already cleaned milk pipe and recontaminates it. This effect is readily seen in a milking machine with a "Pyrex" milk pipe. When the bail furthest from the releaser is reached the cups must be rinsed with double the quantity of cold water—4 gallons.

Before the last 4 gallons of cold water are put through, the releaser should be put out of action by pulling the pulsator tube off the spit chamber and doubling it back on itself to prevent air leakage. This will cause the releaser to flood and rinse the line to the vacuum tank.

After the cold water a boiling detergent solution should be used. At least 1 gallon of solution (¼oz. per gallon of detergent for the Ruakura-type alkali or, once a week, ½oz. of Ruakura-type acid detergent) should go through each set of cups **with 2 gallons for the last set.** While the detergent is going through the vacuum should be broken three or four times by pulling the plug in the end of the milk line. This ensures a strong scrubbing action in the milk pipe and serves to release the detergent which has flooded into the vacuum tank. (A bucket may be placed to catch this detergent for later use if necessary.) It is very important to prevent strong detergents from reaching the vacuum, where they can do a lot of damage by removing the oil film.

Finally, a boiling water rinse at the rate of 1 gallon per set of cups should be passed through the plant in exactly the same way. Throughout these processes the cups should be lifted from the bucket from time to time to let in a gulp of air. During the final rinse the cups should be lifted once only to maintain the temperature of the water. It is important that the water should be as hot as possible. Though it is true that the temperature of the water falls due to boiling in the vacuum, it is also true that the sterilising of the teat cups depends on the hotness of the water.

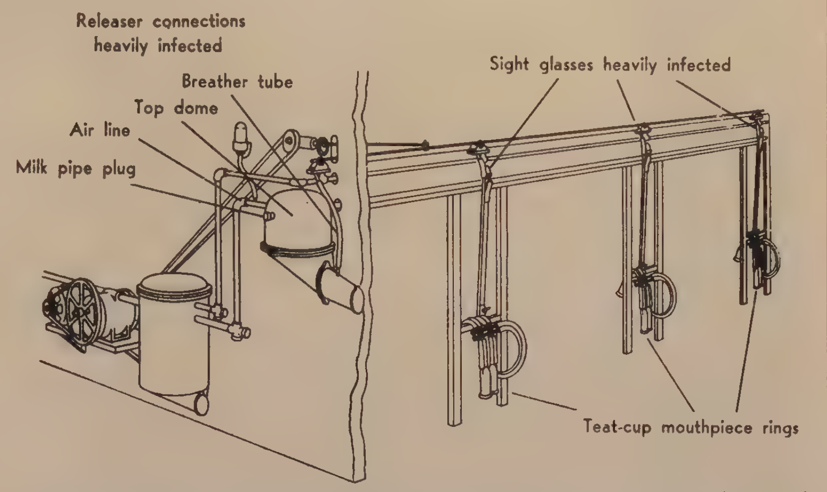

Releaser connections heavily infected
Breather tube
Top dome
Air line
Milk pipe plug
Sight glasses heavily infected
Teat-cup mouthpiece rings

Diagram showing the parts of a milking machine where bacteria are to be found in the largest numbers.

No matter what detergent is used, for really effective cleaning the water should be boiling and the plant must be cleaned at both morning and evening milkings.

Finally, the releaser must be taken to pieces, all bungs removed, the sight glasses opened up, the vacuum tank taken down, and the cups hung up in a cool, well-ventilated place out of the sun.

Special Cleaning Problems

Fatty deposits on coolers and other milk-handling surfaces: Ruakura alkaline detergent used at double strength (½oz. per gallon) in hot water scrubbed on to contaminated surfaces will quickly remove fatty deposits.

Swollen releaser flaps, inflations, etc.: Strong caustic soda is the only common substance which will remove fat from rubber. The usual cleaning concentration (0.05 per cent.) has no practical effect on the fat in rubber, but a 5 per cent. solution of boiling caustic soda will remove fat fairly quickly. The solution should be made up in an old metal container because of the corrosive effect on tin. One pound of caustic soda is dissolved in 2 gallons of water and the rubber components allowed to simmer in the mixture for at least 4 hours. Extreme care must be taken to avoid spilling the solution on the clothes or hands; it is very corrosive. This treatment will remove butterfat and sterilise the rubber parts.

Milkstone Deposits

If a farmer has been using methods which have caused milkstone deposits to build up, a change-over to alternating alkaline and acid detergents may present trouble. The new detergents may loosen quite large pieces of milkstone deposit, which may find their way into the milk with resultant bad effect on quality. It is a help in such a case to use double strength acid (1oz. to the gallon) and to scrub or brush the affected parts. After the acid has been allowed to work for a while (an hour or so) to soften the milkstone, the brush may be used and finally the plant flushed with normal strength alkaline detergent, which will neutralise the acid. A water rinse is then used to remove the alkali.

Sometimes parts such as claw pieces become very heavily encrusted. In such cases double-strength acid solution should be mixed up in an old tin and the affected part soaked overnight. This will soften all but the worst milkstone formations and brushing will then prove effective. Again, a final rinse with alkaline detergent at normal strength is recommended.

Care with Tin Surfaces

Acid detergents which effectively remove milkstone will, like strong alkalis, attack tin surfaces. Therefore acid detergent solution should never be left standing in a valuable tinned steel bucket.

For the same reason, more than double-strength acid solution should never be used and an old tin should always be used when a prolonged soaking is being carried out.

Ruakura-type alkaline detergent has almost no effect on tinned surfaces. The acid detergent, however, is intended for routine use on one day a week only and will, if left in contact with a tinned surface, tend to remove some of the tin. However, only prolonged soaking has any marked effect. Tests at Ruakura show that even double-strength acid solution used as recommended on one day of every week for 2 years has an effect which is so small that it cannot be detected.

Show Dates

THE following are the dates and venues of A. and P. shows:—

*19 April—Mackenzie County A. and P. at Fairlie.

19 April—Strath-Taieri A. and P. at Middlemarch.

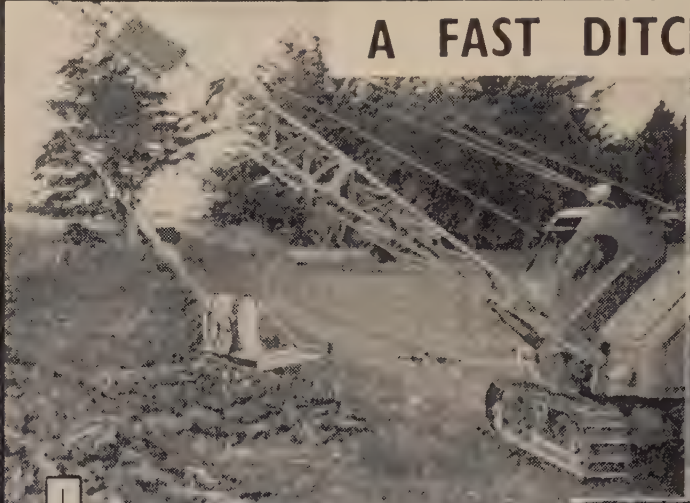
Winter Shows

16, 17, 18, and 19 June—Taranaki Metropolitan Agricultural Society at New Plymouth.

17, 18, and 19 June—Te Kuiti and District at Te Kuiti.

* The Department of Agriculture exhibit will be staged at this show.

A FAST DITCH-CLEANING MACHINE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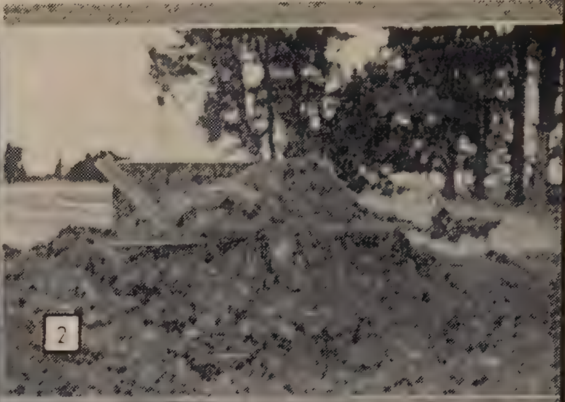
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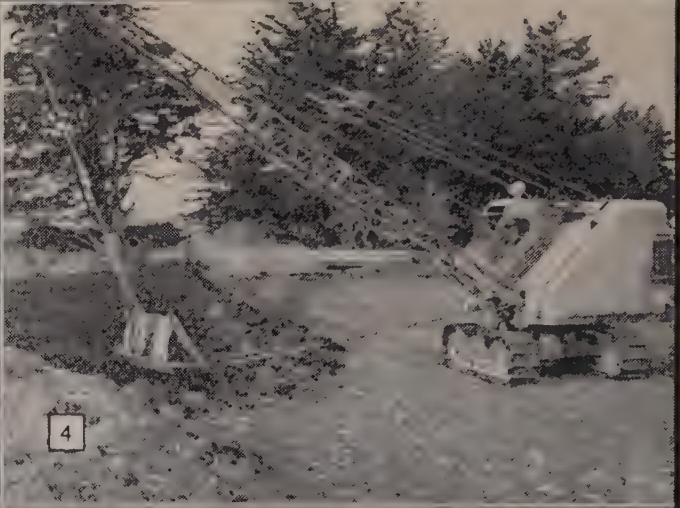
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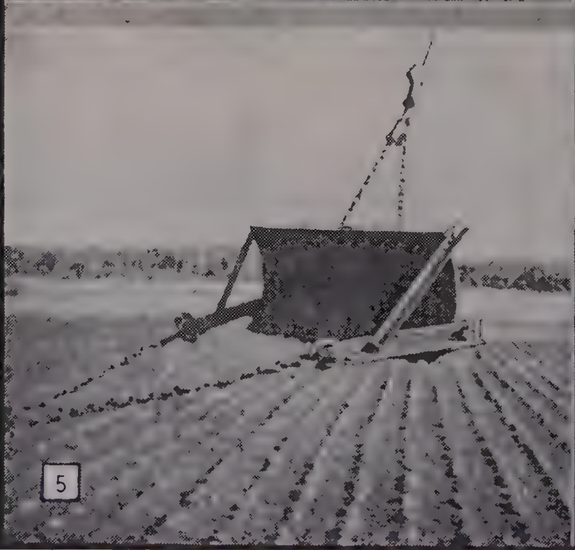
The equipment illustrated enabled a ditch 6ft. wide at the bottom, 6ft. deep, 12ft. wide at the top, and badly choked with 18in. to 2ft. of watercress and mud, to be cleaned at an average rate of a chain every 5 or 6 minutes. 1—Spreading the spoil on the first run. 2—The position of the blade on the first run. 3—Finishing the spreading on the second run. 4—The complete machine. 5—The blade. 6—Throwing the blade.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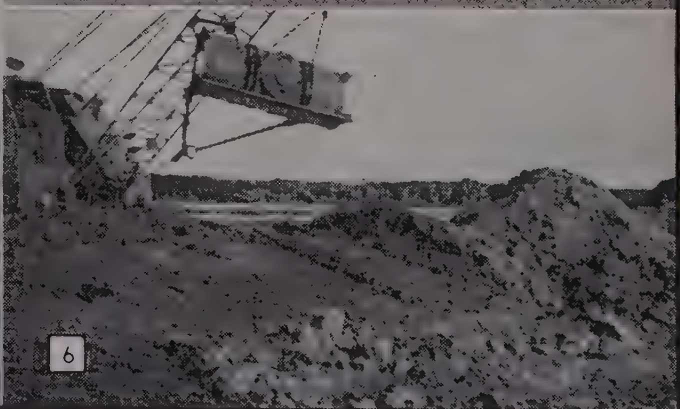
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HEADING PHOTOGRAPH: A ditch measuring 6ft. x 3ft. x 10ft. which had been cleaned 3 weeks before at the rate of a chain every 3 to 4 minutes.

Regular Ditch Cleaning as an Aid to Increased Production

By K. L. MAYO, Drainage Advisory Officer, Department of Agriculture, Invercargill

THE New Zealand farmer probably leads the world in production per unit of labour because he has mechanised farming operations wherever possible. However, one routine job which has not been mechanised to any extent is the yearly or 2-yearly cleaning of drainage or irrigation ditches. This important work is often neglected because there is seldom labour available, let alone the time, but neglect limits production on many farms.

PROBABLY the most desirable type of ditch-cleaning machine would be one which would move continuously along parallel with the ditch, cleaning as it went. It would, of course, need to be cheap to operate and should preferably be of local manufacture. Different sized machines would be required for varying ranges in ditch size so that each machine would be kept working to capacity. Speed would also be necessary so that the maximum length of ditch could be cleaned in summer and autumn, when there would be a minimum of water present.

Mr. W. Allison, Heddon Bush, Southland, has invented and patented a blade attachment for a standard track-laying dragline excavator which fulfils all the stated requirements and which can also be used to batter ditch banks so that the ditches are not a menace to stock. The machine has been used also to spread the material cleaned out of the ditch. The excavator is powered by a 60 h.p. diesel motor. The blade is 7ft. long, is weighted and slightly concave, and is attached to the boom rope from behind and the drag rope from in front.

The machine travels parallel with the ditch, with the boom at right angles to the ditch at such a distance as to allow the blade to be dropped against the opposite bank of the ditch and pulled across the bottom, up the bank, and to within a few feet of the excavator. The weight of the blade holds it tightly on the bottom and against the bank, and the weeds and mud are left in a neat row about 6ft. back from the edge of the ditch, from where the cleanings can be removed easily. The debris removed in the regular cleaning of ditches would consist only of water weeds, which are resistant to weedkillers, and a little mud. Once this deposit dries out the mud can easily be harrowed over the paddock, which prevents the banks from building up. Because the blade has no "bite", it does not damage the ditch bottom or the grassed bank sides. An even better job is made when the machine has been used to clean the ditch for the second time.

A Time Saver

Another feature of this machine is its ability to handle the spoil immediately it is removed from a ditch. In digging new ditches Mr. Allison can substitute the blade for the bucket in 5 minutes and in an hour can spread the spoil removed during 8 hours' digging the day before. In 5 minutes the blade can be changed for the bucket once more and ditch digging continued.

Bulldozers cannot handle this spoil for at least 6 months, until it hardens, and in the meantime it becomes a breeding ground for a host of weeds. In spreading the spoil the machine travels first in one direction, and then on the return journey wider out it spreads it even more and still lower, with the result that there is no empty running.

The writer timed Mr. Allison cleaning a ditch 6ft. wide at the bottom, 6ft. deep, and 12ft. wide at the top which was badly choked with at least 18in. to 2ft. of watercress and mud. The water was at least 1ft. deep when the ditch was cleaned out and each chain took an average of 5 to 6 minutes to clean. One chain was completed in 3 minutes. On smaller or cleaner ditches it has been possible to operate at even faster speeds and the rate of 1 chain per minute has been attained. In a badly overgrown ditch which was 3ft. wide at the bottom and 6ft. deep and which had a batter of 1ft. in 1ft. the average speed was 2½ chains in 5 minutes. Mr. Allison's machine has a 30ft. boom, but he considers that a 35ft. boom would be more suitable, as it would mean that the machine could be worked with greater ease on large ditches.

Though it is realised that an excavator would be necessary as the power unit for work on larger ditches, it is thought that the principle used could be adapted to 40 to 50 h.p. diesel track-laying tractors by the use of a hydraulic unit or boom and brake winches for cleaning the smaller ditches. The blade, of course, would have to be reduced. Mr. Allison considered a 40 to 50 h.p. diesel engine could handle a 4ft. blade. These attachments should be of value to bodies which have excavators, such as catchment boards, county councils, and the Ministry of Works. Groups of farmers on the pumped areas of the Hauraki Plains and Whakatane districts could well consider co-operative ownership of complete units and consideration by contractors of their use should be worth while.

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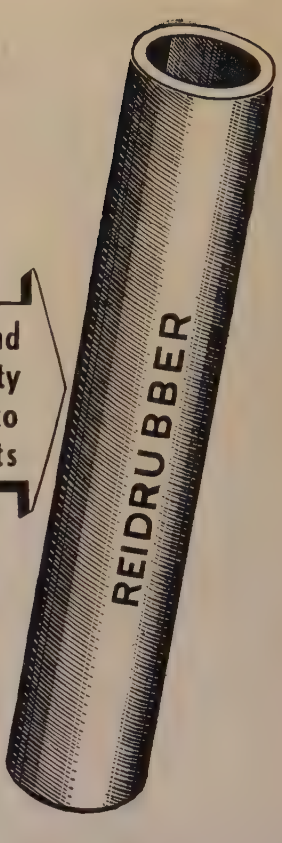

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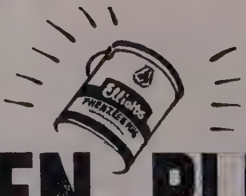

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Recent Research Work

PASTURE IMPROVEMENT

THE oversowing of inferior pasture swards on dairy farms with ryegrass and clovers is often advocated as a quick and economic method of pasture improvement, but carefully conducted trials and general experience indicate that unless seed-bed conditions, weather, and subsequent grazing management are particularly favourable, little improvement is obtained. These notes describe the results of some oversowing pasture trials in Taranaki.

OVERSOWING TRIALS IN TARANAKI

IN the autumn of 1952 ½-acre plots were sown on 18 different farms in north Taranaki. Pastures were selected which were poor in ryegrasses and clovers, and on each farm ¼ acre was harrowed heavily or disced to obtain a seed-bed and ¼ acre was left unharrowed. The seed mixture sown comprised 10lb. of short-rotation ryegrass, 10lb. of perennial ryegrass, 2lb. of white clover, and 2lb. of Montgomery red clover.

In general the weather after sowing was very good, being mild with ample rain. In nearly all the trials the grasses and clovers were observed to strike quite well, but the subsequent growth was disappointing and in none of the trials could one go into the paddock and notice any marked improvement in the surface-sown area. A close inspection revealed a few scattered plants of short-rotation ryegrass and red clover (the two plants most easily recognised), but there was no marked increase in clover and ryegrass generally, so it was assumed that the total effect must have been small. There was in all plots a better strike of grasses and clovers on the surface-cultivated area, but there was a good strike only where the plot was disced and chopped up so much that the surface was left very rough. In addition to a good strike of grasses and clovers there was also an increase in weeds where the sward was opened up most. In all trials the plots or the whole paddock in which plots were placed were topdressed with phosphate and potash and in most pasture management was good.

The results of these trials confirmed the results obtained from a more detailed surface sowing trial carried out on a farm near Egmont Village 2 or 3 years previously. In this, surface sowing even after spraying to kill flat weeds and harrowing and heavy topdressing combined with first-class pasture management had very little effect in improving the pasture.

MOST SUITABLE SEED-BED

Many of the claimed successes for oversowing have been obtained on farms newly taken over and on which surface sowing has been carried out at the same time as subdivision, rotational grazing, and increased topdressing. In the writer's opinion the surface sowing has been given all the credit for improvement, some of which has been brought about by these other factors. There is no doubt, however, that short-rotation ryegrass and clovers have been introduced into paddocks by surface sowing and in some cases have helped to increase the production of those paddocks considerably. The most suitable conditions are when a paddock has been cut up badly by stock during the winter and is then harrowed or rolled and surface sown. There is such a good seed-bed that the grass has every chance of establishing well. The most important factor is the smoothing and consolidation of the ground before the seed is sown. When surface sowing is carried out in autumn, the pasture should be as bare as possible and harrowed with a penetrating harrow or given a light discing to make a seed-bed. The small seedling plants do not grow anywhere near as quickly as they do when sown on cultivated ground, and therefore the pasture must be closely watched to see that the young plants are not damaged by stock before they get properly established.

RECOMMENDATIONS

Some good results have been observed from surface sowing on dairy farms when the conditions are suitable, but disappointing results are common. Under no circumstances does surface sowing compare with ploughing and sowing, and it is therefore recommended that it be used only to supplement ploughing and sowing when (a) paddocks become very cut up during feeding out in the winter, or (b) when the whole farm is in poor condition and an attempt is made to bring about temporary improvement of the paddocks which will not be ploughed for some years. In all such cases subdivision to allow good pasture management and ample topdressing with phosphate and potash are essential.

—A. C. BURGESS

* * * *

OVERSOWING HILL COUNTRY

TOPDRESSING and oversowing experiments of 7 years' duration on Mangatea clay loam in the Tikitiki district of the east coast of the North Island show results which can be used as a guide for the improvement of this type of country. Mangatea clay loam is a banded mudstone and sandstone soil with some ash intermixed. The original cover was broadleaf forest and kahikatea and the topography is that of easy to rolling country inclined to slumping. At the time of oversowing, the pasture consisted mainly of danthonia and browntop with a little ryegrass, paspalum, and poor white clover. Plots were sown with Mt. Barker and Tallarook subterranean clovers, alone and in conjunction with white clover; white clover alone; and *Lotus major* and Montgomery red clover. Sowings were made both with and without phosphate. All species struck well, but only the subterranean clovers and white clover established satisfactorily within the 7-year period. The application of phosphate—in this case superphosphate—showed a marked and highly payable improvement in density of sward and vigour of growth.

Recommendations for this type of soil on the east coast of the Gisborne district are:—

1. Sowings of white clover and subterranean clovers only are worth while.
2. Subterranean clover should be kept to the harder, drier faces and white clover should be used elsewhere.
3. Sowing rates should be: White clover 2lb., subterranean clover 3lb. (1½lb. of Mt. Barker and 1½lb. of Tallarook).
4. Seed should be sown with 2cwt. of superphosphate and a dressing of the same amount applied the next year. A spell from topdressing of not more than 3 years could then be given, but a dressing every other year would be advantageous.

—H. de O. CHAMBERLAIN

Protecting Young Fruit Trees from Rabbits

By J. COOMBE, Horticultural Instructor, Department of Agriculture, Christchurch

YOUNG fruit trees frequently suffer from attacks by rabbits and hares. Even if the trees are not completely ring-barked, such injuries may prove detrimental to growth for a long time and may even result in permanently misshapen trees.

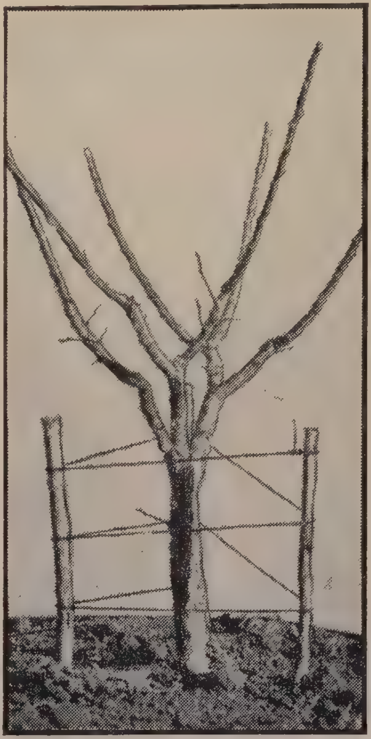
DETERRENTS used in the past have often not proved successful. A completely successful method is to surround the orchard or each individual tree with wire netting, but this is costly.

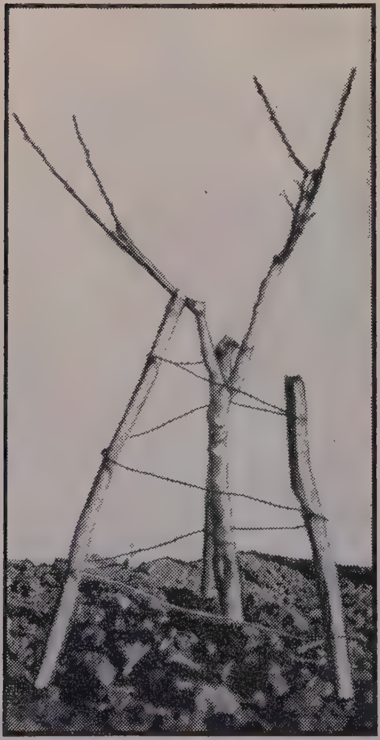
A system adopted on a block of young apricot trees in a Roxburgh orchard has proved to be very effective over the last 3 years. The usual method in Central Otago is to wrap newspaper round the trunk, but owing to the necessity of applying experimental sprays to this block, another means of protection had to be found, as the time required to rewrap the trees after each spray would have been too great.

The method used was to drive in 3 manuka stakes round each tree, and then wind tarred twin (2 or 3 ply) round the stakes.

The stakes were cut about 20in. to 24in. long and were ¾in. to 1in. in diameter. They were driven 6in. to 8in. into the ground about 6in. from the tree trunk, so that they formed a triangle.

The stakes had to be made firm so that they did not lean in toward the tree; otherwise damage to the tree was likely to take place if the tree rubbed against the top of the stake.


Stakes should be upright and far enough away from the tree to avoid having branches rubbing on them.


Damage to the tree will occur if stakes are allowed to slope in toward the tree.

At least 3 complete turns of twine were required round the stakes. Winding was begun by tying the tarred twine about 3in. from the bottom of one stake and winding upward until the desired height was reached. The top round needed to be only from 12in. to 15in. above ground level and each round from 4in. to 5in. apart.

On trees in this block even the shoots which were overhanging the twine were not barked or chewed by rabbits. No damage has occurred during the 3 years this method has been in use, though trees alongside this block have been damaged by rabbits.

How long the twine would remain effective is not known. In this area it was renewed each year at the beginning of winter when the stakes were straightened or consolidated in the ground, as it was not intended to run any risk of damage. The twine would apparently last for at least 2 years and retain its smell, which seems to be the main deterrent.

This method also allows hand weeding and cultivation to be carried out satisfactorily and assists in keeping tractor implements further away from the trees, thus minimising damage from this machinery.

Acknowledgment

Thanks are due to Mr. S. F. De Silva for this information.

Marginal Lands Development

THE increasing interest taken by farmers in marginal land development is evidenced in the annual report of the Department of Lands and Survey for 1953.

The report states that the most significant feature of the year's operations under the Marginal Lands Act has been the growing awareness among farmers of the assistance available to them under the Act. This, coupled with the difficulty of raising finance through normal lending channels, has brought about a steadily increasing flow of applications, with the result that at the end of the year there were almost as many applications under investigation by Marginal Lands Committees in the various districts as had been considered by the Marginal Lands Board during the year. This increased activity was more evident in some districts than others. Though it reflected the scope for development in the different districts, it varied according to the attitude of existing finance organisations to making money available. The desire of farmers in these districts to increase their production and the extent to which forms of assistance under the Act were known also had a marked effect on the number of applications lodged.

The district which has registered the greatest interest to date is North Auckland; it has handled more than one-third of the total applications received in all districts. The brisk response to the legislation in this district is evidence of its need, and it is doing much to enable the very great potential existing in the north to be developed. There are other districts with a similar potential, and from inquiries being received a further increase in applications will no doubt result in these as the forms of assistance become more widely known and appreciated by individual farmers.

Inquiries regarding applications for assistance under the Marginal Lands Act should be made to the local office of the Department of Lands and Survey, to which assistance is given by officers of the Department of Agriculture by making inspections and giving advice.

New Bulletin on Poultry Keeping

Eggs, like vegetables, are at their best when fresh. The knowledge required to keep fowls on a small scale is not great, but the essentials of management should be thoroughly understood and consistently applied. Failure to obtain satisfactory egg production from a household flock is often caused by lack of knowledge of the simple rules of management.

"Household Poultry Keeping", a bulletin just published by the Department of Agriculture, covers all aspects of poultry keeping for those with small flocks. The 64-page bulletin is well illustrated and contains an index. Copies of Bulletin No. 336, "Household Poultry Keeping", are available from main offices of the Department at 1s. per copy.

Rhubarb and Asparagus in the Home Garden

MOST vegetables grown in the home garden are annuals or biennials and as a consequence the possibilities of growing perennial crops are often overlooked by the home gardener. Perennial crops have the advantage over annual or biennial crops that once they are established they can be cropped for years without attention other than cultivation and manuring whereas annual and biennial crops are liable to fail if subjected to adverse conditions during the critical period of establishment after sowing. Two crops that are well worth growing in home gardens of sufficient size are rhubarb and asparagus.

IN the first part of this article A. G. Kennelly, Horticultural Instructor, Department of Agriculture, Dunedin, discusses some aspects of the maintenance and establishment of these crops. The section of the article dealing with routine garden work is by S. O. Gillard, Horticultural Instructor, Department of Agriculture, Auckland.

Rhubarb Culture

Rhubarb is hardy, easy to grow, and yields heavily if given adequate moisture and plant food. The soil should be well drained and preferably well supplied with organic matter. The lighter soils that dry out quickly are less suitable than the heavier, well-drained soils.

Selection of Varieties

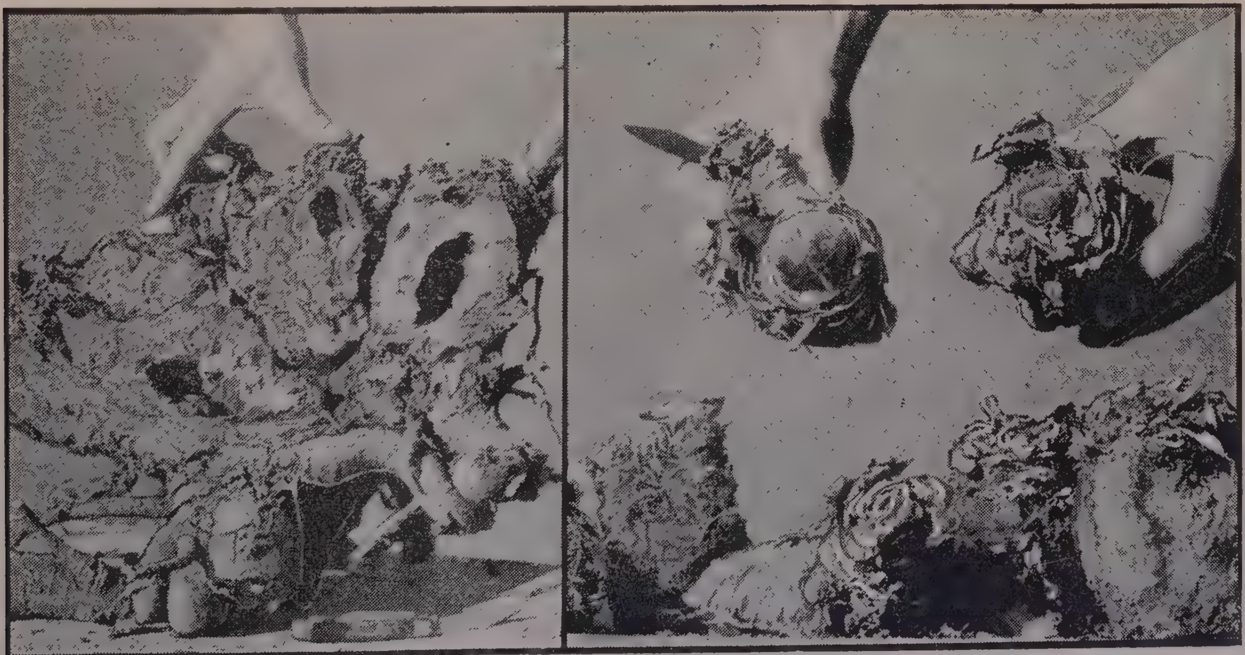
In New Zealand, varieties of rhubarb can be grouped as early, main crop, and ever-bearing, though in good soils that contain sufficient moisture most varieties can be grown throughout the year. It is advisable, where possible, to choose a variety of which the quality and vigour are known to be good, as some varieties listed are not always true to name.

Division and Replanting

Rhubarb can be raised from seed, which it is usual to sow in spring, but to get varieties true to the parents, plants for new beds must be obtained by breaking up existing crowns.

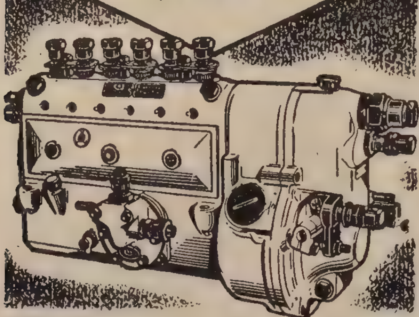
Under general conditions rhubarb should be lifted every 4 or 5 years, as the roots tend to become hollow and weaken if they are undisturbed for longer. After the crowns are lifted they should be separated by severing

Photographs on this page by Green and Hahn

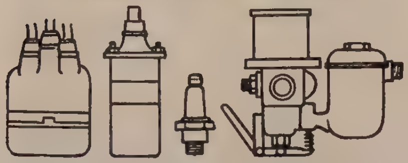


Left—Rhubarb crown showing hollowing, which usually develops after a few years. It is advisable to dig up such a crown, split it, and replace it in sections. Right—Sections of a rhubarb crown showing the large buds, each of which with a piece of root is capable of developing into a plant.

ONE UNIT



THAT DOES THE WORK OF FOUR!



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with a sharp spade. Each single crown to be replanted should have a piece of root attached, and if a crown is set with its top about 1in. below the soil surface, a good plant should develop in a season.

In the home garden crowns should be set out 24in. to 30in. apart in rows 30in. to 36in. apart, according to the vigour of the variety.

Harvesting

Unless plants are very vigorous, they should not be harvested until the second season after planting. In harvesting, the leaf stalk is grasped near the base and pulled with a twisting motion. Plants should not be denuded of their foliage; nor should they be harvested for too long without an adequate rest period, during which a good growth of leaves should be permitted to flourish to build up reserves for the next season's harvesting.

Manurial Treatment

Established beds need little attention, but should be kept weed free. Unless the soil is in very good condition, it should be dressed, preferably during autumn, with organic material such as farmyard, stable, or poultry manure or compost. Alternatively, blood and bone at 4oz. to 6oz. to the square yard will give good results on soils that are well supplied with moisture and of good tilth. In addition, liquid manure or two or three applications of sulphate of ammonia or dried blood at 1oz. to the square yard may be advisable. However, as the early dying down of the leaves and ripening of the crowns are usually important factors in the successful culture of early and main-crop rhubarb, it is not advisable to apply stimulating fertilisers after the application following the last pulling in districts where the top growth dies down.

Forcing

Rhubarb can be forced by covering the crowns with boxes or straw. An early variety should be chosen for this. If a glasshouse is available, complete clumps can be lifted and planted under the benches with a scrim curtain in front to keep the light out. Forced rhubarb has less development of the leaf blade and the stalks are more tender and sweeter.

Asparagus Culture

An asparagus bed properly established and cared for should last 20 years or more. If a new one is planned, the site should be deeply dug and well manured with material such as well-rotted stack-bottom, stable or farmyard manure, or compost several weeks before planting. All perennial weeds should be removed and, if necessary, the area drained by breaking the subsoil or, where drainage is very poor, by installing field drains. Built-up or raised beds are an advantage where the surface soil is shallow or drainage is poor.

Varieties

Popular varieties are Mary Washington, Martha Washington, Connovers Colossal, and Paradise, but there are other good varieties which may suit different districts.

Raising Plants from Seed

Seed may be sown in September or October if ground conditions are favourable. The soil should be well drained, of fine, firm tilth, and with good humus content. Seed should be sown thinly ½in. deep in rows 18in. to 24in. apart and the seedlings later thinned to 4in. apart in the rows.

[Green and Hahn

Asparagus is a useful spring vegetable and one that deserves a place in every home garden when there is space for it. The shoots should be cut carefully.

Setting out Plants

In August or September (according to climate) of the following year the young plants should be set out in their permanent positions. If desired, the young plants can be left in the seedling rows for 2 years before being set out in their permanent positions, but they should then be thinned in the rows to 8in. apart. Greater care must be taken in shifting 2-year-old plants than with 1-year-old plants. Male plants give a larger yield than female plants, but it is rarely practicable to sort the sexes and discard the female plants.

Though where the soil is dry enough new beds may be planted toward the end of July, August is usually the best month for planting asparagus in the North Island; later planting is advisable in most southern districts, where growth begins later and soil conditions in August are often unfavourable.

For the home garden it is usual to buy plants from a seedsman. One-year-old seedlings are usually preferred, as they transplant better and establish more readily than 2-year-old crowns, which are considerably larger and therefore more subject to damage during transplanting.

The crowns should be planted 18in. apart in single or double rows, but the bed for a double row should be not less than 42in. wide. Crowns can be set about 8in. below soil level with the roots spread evenly over a small heap of soil in the bottom of a trench. The top buds should not at first be covered by more than about 2in. to 3in. of soil, as the young plants are liable to be smothered and retarded if they are deeply covered before they have become established and are sufficiently strengthened.

As growth develops the trench should gradually be filled in and at the end of the year after planting out the trench will have disappeared and the ground will have been restored to level.

[Green and Hahn

In exposed situations asparagus fronds may need support, which can be given quite simply by twine supported at 5ft. to 6ft. intervals by stout stakes.

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Soil and Manures

Asparagus grows well in a wide range of soils, but excellent results can be expected in well-drained, free-working loams. The popular belief that salt is essential is not borne out by commercial experience, though the plant is known to be tolerant of it.

A fertiliser that has given good results over a wide range of conditions consists of 4 parts of blood and bone, 1 part of sulphate of ammonia, 3 parts of superphosphate, and 1 part of sulphate of potash. This mixture can be applied at about 2oz. to 4oz. to the square yard, preferably in early spring or after the last cutting. Alternatively, blood and bone at 3oz. to 5oz. to the square yard or farmyard or similar manure can be used and will usually give satisfactory results.

Lime should be applied with caution, though on most soils a little lime each year, say about 1oz. to 2oz. to the square yard, is likely to be beneficial in increasing the availability of plant foods.

Treatment of Growing Plants

In exposed situations asparagus fronds may need support, and they can be supported quite simply by stout string tied to stakes driven into the ground at 5ft. to 6ft. intervals. Top growth should not be cut until the fronds begin to turn yellow through the onset of cold autumn weather. While the tops are green the plants are manufacturing plant food and building up the crowns from which strong spear growth can be cut the following spring. If, however, cutting of the fronds is deferred too long, the seed ripens and falls and young plants which come up the following season are often unnoticed and become established to the detriment of the bed. Fronds can be cut with a knife, secateurs, or with heavy shears. It is a good plan after cutting, if composting is not convenient, to leave the cut top growth on the bed until it is properly dry and then burn it there. Most of the minerals it contains and which were taken from the soil can thus be returned if the ashes are scattered or raked evenly over the bed. Burning will also reduce the germination of ripened seed. Afterward the bed should be weeded, lightly forked over, and dressed lightly with organic manure and, if desired, with artificial manure.

Harvesting

Spears are usually cut with a sharp knife or special cutter which has a double V-shaped or chisel point. They are usually cut when they are about 6in. to 10in. long and before the tips or heads start to develop. The spear is pulled gently so that its position can be determined, and, if the operator is experienced, it can be cut with a single thrust without causing damage to other spears. The spears arise from crowns, and it is usual to cut the spears about 2in. below the soil surface, but at least the same distance above the crowns so that the crowns are not injured. In loose soil spears can be broken off by bending them with the hand, but if spears are broken off too deeply, the butts may be too fibrous and may require trimming. Cutting usually ceases about the end of November or middle of December, according to district, and the beds should then be cleared of weeds, cultivated, and, if required, manured.

[*Green and Hahn*

Asparagus tops should be cut before the seed ripens.

The period during which asparagus can be cut varies greatly according to the bed and may range from 6 to 10 weeks. Harm is likely to be done to young beds by too early cutting. Only if the growing season is long and the plants well established should a cutting of more than 2 weeks be made during the third year from time of sowing the seed (the second year after the setting out of 1-year plants). In the fourth year the cutting period should not exceed about half the season or about 4 weeks. Thereafter cutting can continue each year for from 6 to 10 weeks according to season of growth and vigour of the bed.

Work for May

Vegetable supplies can usually be maintained satisfactorily between spring and late autumn, but for winter growing special care and skilled attention are called for. Not all gardens lend themselves to winter cultivation, but much can be done toward improvement by making raised beds to give better drainage and soil warmth. Paths between beds should be graded to allow water to run off. Where the garden is exposed an endeavour to provide some protection from cold winds should be made. Growth depends to a large extent on soil warmth, and in winter two of the major factors which keep the soil cold are excess water and cold winds. Heavy, puggy soils may be improved by the addition of sand or sawdust.

Advantage can be taken of the winter months for trenching or digging the land and leaving it in a rough state exposed to wind, rain, and frost. The elements have a very beneficial effect on the soil and besides destroying harmful insects make heavy soils more friable.

Potato, kumara, and any late-maturing pumpkin or squash crops should be harvested without delay, as no further growth can be expected. If a frost is experienced while pumpkins or squash are still in the field, it is likely to impair their keeping qualities.

The tubers of Jerusalem artichokes should now be ready to use.

Cultivation of growing crops should be frequent, but should be done only when the soil is sufficiently dry to work freely. Wet, sticky soils are inclined to compact, and this condition is further aggravated if the gardener is walking over the ground when it is very wet. Cabbages, cauliflowers, and brussels sprouts should be kept moulded up, and moulding up of mature leeks should be completed, care being taken not to cover the heart leaves with soil. Rhubarb beds should be cleaned of weeds and any seed stalks or old, dead leaves

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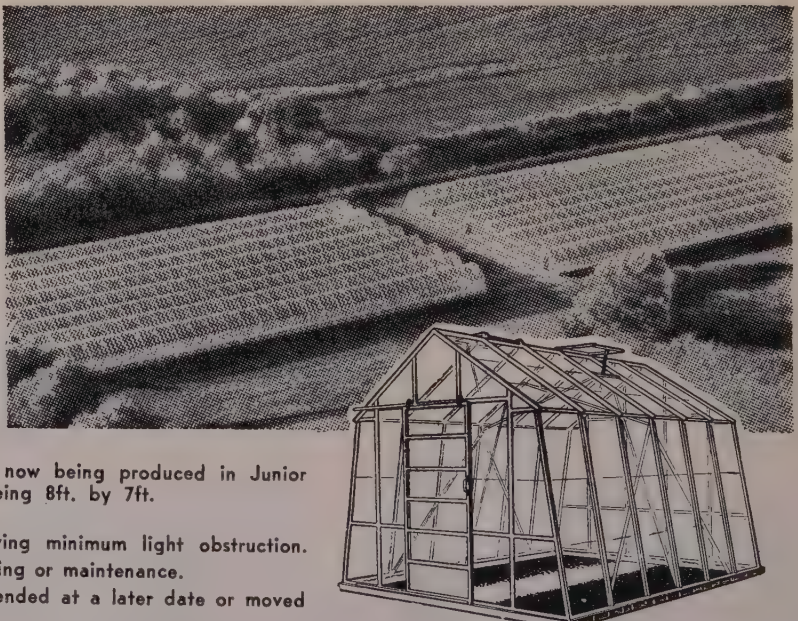

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Broad beans can be sown in most districts now. Left—Long Pod. Right—Broad Windsor. [*Sparrow*

removed. Fern growth of asparagus should be cut and burnt and the bed should be tidied up. Vegetables in storage should be examined and any showing signs of rot should be removed. Vacant ground may be sown to a quick-maturing cover crop and newly dug ground may be limed.

If the garden is given a good clean up, it can be made to look attractive even though there may be little growing in it. All waste material free of disease can be placed on the compost heap. Compost heaps should have some protection in winter, as water-saturated heaps become cold and decomposition practically ceases.

Tomato and bean stakes should be removed as soon as they are no longer required, tied into neat bundles, and stored. Untidy corners where grass growth has been allowed to flourish should be cleaned up.

Rubbish left in heaps on or near the garden area provides a breeding place for pests such as slugs, snails, earwigs, slaters, cutworms, millepedes, stem borers, and wireworms; heavy grass or weed growth in or adjoining the garden provides a means whereby pests such as thrips, mites, green vegetable bugs, and aphides and also fungus diseases may be carried over from one season to another.

Fertility of Garden Soils

No matter how rich the soil may have been when the garden was first started, after a few crops of vegetables have been produced it will require liberal applications of plant food to maintain its fertility. Most vegetable plants are gross feeders, and where continuous cropping is practised there is a constant drain on the plant food in the soil. In many home gardens where a supply of vegetables is maintained and the same land is cropped again and again the plant food supply must be restored periodically or sooner or later the soil will become exhausted.

Where stable or farmyard manure or good compost is not available in sufficient quantities the home gardener is obliged to use substitutes such as proprietary fertilisers. The latter, even where they include manures such as dried blood or blood and bone, usually contain very little humus-forming material. Well-balanced mixtures will supply the mineral requirements of garden plants.

Artificial manures have the advantage of being cleaner and easier to handle than farmyard manure and have a more concentrated food supply. They should be supplemented by working cover crops or other organic material into the soil.

Application of Balanced Fertilisers

The principal nutrients required for plant development are nitrates, phosphate, and potash. Nitrogen promotes growth and leaf, phosphate promotes fruitfulness, early ripening, and root action, and potash strengthens the plants and improves quality. Generally, addition of these three materials should maintain all plant requirements in most soils, especially if organic material is also worked in.

The amount and type of fertiliser required depend on the soil condition and which kind of vegetable it is intended to grow. For instance, vegetables which are leafy, such as cabbages and lettuces, require more nitrogen than do root crops, such as carrots or beetroot, which require a greater amount of phosphates than do leaf crops. Potash is required in small quantities by all vegetables, and though it should not be used to excess (about 1oz. to a square yard is sufficient for each crop), it should not be omitted.

Storage of Manure

Unless adequate storage facilities are available, it is inadvisable to buy manures that are not to be used within a short time. This applies particularly to artificial manures such as nitrate of soda, sulphate of ammonia, or superphosphate. Artificial manures should be stored in a dry place, and are best supported an inch or two above floor level so that the air can circulate about them. If stored where conditions are damp, most artificial fertilisers readily absorb moisture and harden quickly, often to a rock-like consistency which must be broken down before they can be used. Small quantities of artificial manure can be stored safely in stout, properly lidded containers which should be kept closed to keep out moisture.

The same precautions are not necessary for storage of most organic manures. Manures such as dried blood or blood and bone do not deteriorate to the same extent as artificial fertilisers by the absorption of moisture from the air, but they are much easier to handle if kept dry. Poultry manure when stored outside

[*Sparrow*

When a crop is harvested and the land is not required immediately for growing a vegetable crop it can be dug and sown with a green crop or limed as shown above.

and, to a less extent, horse and farmyard manures, should be covered if they are not to be used immediately. If subjected to leaching by heavy rains, they are likely to lose much of their valuable properties.

Sowings

Broad beans: In most districts May is a suitable month for a first sowing of broad beans, which are hardy and do especially well in cool weather in most well-drained soils. Seed may be sown in double rows about 6in. apart with 4ft. between each set of double rows or in single rows 3ft. apart. Seed should be set 2in. deep and 6in. apart in the rows. For double rows seed should be placed diagonally and not opposite one another. Early sowings in heavy soils are best made on low ridges. Recommended varieties are Early Long Pod and Broad Windsor.

Radish: In Auckland and Northland the soil should still be warm enough to grow this salad crop. Good varieties are French Breakfast and White Icicle.

Onions: Where plants are required for setting out in spring seed should be sown without further delay and before the soil becomes too cold for good germination. A good keeping variety is Pukekohe Long Keeper. Straw Spanish is a good early-maturing onion which also stores well.

Plantings

Cabbages: Plants can be set out in districts where winter conditions are not severe. Suitable varieties are Hendersons Succession and Savoy Drumhead.

Shallots: Bulbs can be set out in May or June. For planting the clusters are divided; the larger bulbs produce more plants per bulb. Drills should be drawn 1in. deep and 12in. apart and the bulbs pressed into the bottoms of the drills 6in. apart and then lightly covered with soil.

Radio Broadcasts

RADIO broadcasts to farmers will be given during May as follows:—

1YA Auckland, 7.15 p.m.

5 May—"Drainage", by D. F. Scott, Drainage Officer, Department of Agriculture, Auckland.

12 May—"Shearing before Lambing", by D. G. Austin, Sheep and Wool Instructor, Department of Agriculture, Auckland.

19 May—"Tuberculosis in Cattle", by I. Davison, Veterinarian, Department of Agriculture, Auckland.

26 May—Y.F.C. talk, by Rodney district committee, New Zealand Federation of Young Farmers' Clubs.

1XH Hamilton, 12.33 p.m.

6 May—"Care of the Ewe Flock", by D. W. Caldwell, Veterinarian, Department of Agriculture, Hamilton.

13 May—"Winter Pasture Management", by H. M. Bull, Instructor in Agriculture, Department of Agriculture, Hamilton.

20 May—"A Farmer Looks at Science", by J. J. Shine, Federated Farmers, Hamilton.

27 May—"Tropical Agriculture", by J. C. Gerlach, Agronomist, Department of Agriculture's Rukuhia Soil Research Station.

1YZ Rotorua, 7.15 p.m.

13 May—Y.F.C. talk, by Western Bay of Plenty district committee, New Zealand Federation of Young Farmers' Clubs.

27 May—"Selection of Fruit and Shelter Trees for Bay of Plenty", by H. A. Prew, Horticultural Instructor, Department of Agriculture, Tauranga.

2YZ Napier, 7.10 p.m.

11 May—"Pastures and Their Management", by S. H. Henry, Instructor in Agriculture, Department of Agriculture, Hastings.

25 May—"Topical Notes to Sheep Farmers", by P. C. Marshall, Sheep and Wool Instructor, Department of Agriculture, Hastings.

4YA Dunedin, 9.15 p.m.

12 May—"The Commercial Beekeeper at Work", discussion by beekeeper and I. W. Forster, Apiary Instructor, Department of Agriculture, Oamaru.

19 May—"Pruning Fruit Trees", by W. S. Kemp, Horticultural Instructor, Department of Agriculture, Alexandra.

26 May—"The Use of Lime in the Garden", by A. G. Kennelly, Horticultural Instructor, Department of Agriculture, Dunedin.

Regular Sessions

1XH Hamilton, Mondays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8.5 p.m., Wednesdays at 8.1 p.m. (Northland stock market report), Fridays at 8.1 p.m.

1YA Auckland, Mondays at 7 p.m. (Auckland stock market report), Tuesdays at 12.35 p.m., Wednesdays at 7 p.m., Thursdays at 12.33 p.m.

1YD Auckland, Thursdays at 7.30 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m. (Pig Council talk on fourth Wednesday of every other month), Thursdays at 12.33 p.m. and 7.15 p.m. (fortnightly).

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m.

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawkes Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawkes Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Mondays at 8 p.m., Tuesdays (fortnightly) at 8 p.m., Wednesdays at 8.5 p.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

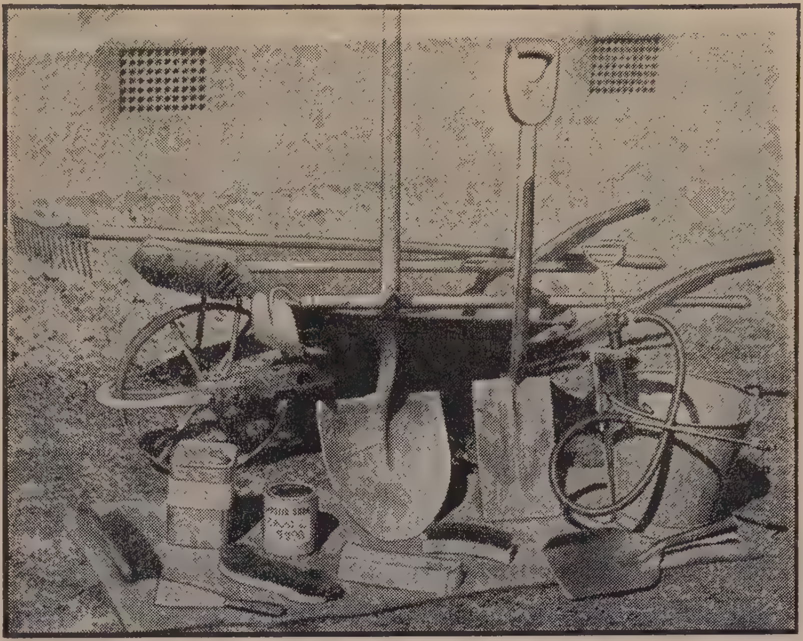
3YZ Greymouth, Thursdays at 12.33 p.m.

4YA Dunedin, Wednesdays at 7.20 p.m., Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m., Tuesdays at 7 p.m.

Prevention of Disease in Household Poultry

THE principle that prevention is better than cure is especially applicable to disease in poultry, irrespective of whether the fowls are kept on a commercial or domestic scale. All classes of poultry keepers should study and practise the principles necessary to minimise disease outbreaks among poultry. In this article for the household poultry keeper H. K. Mullins, Poultry Instructor, Department of Agriculture, Hastings, emphasises the necessity for good sanitation among large and small flocks.



[Fraser Niederer

Some or all of this equipment is needed for the annual clean-up in the poultry shed to establish hygienic conditions before new pullets are put in.

INFECTION may be brought on to the poultry farm in various ways. Dirty crates, sacks, or even utensils from an infected farm can be responsible for an outbreak of disease. Infection can then quite easily spread from one part of the farm to another in the same way. Bought in diseased stock is often responsible for outbreaks of disease, and for this reason household poultry keepers should purchase poultry only from reputable breeders. At auction marts and such places the birds are usually culls and table poultry and cannot be recommended as a source of supply of pullets intended as egg producers.

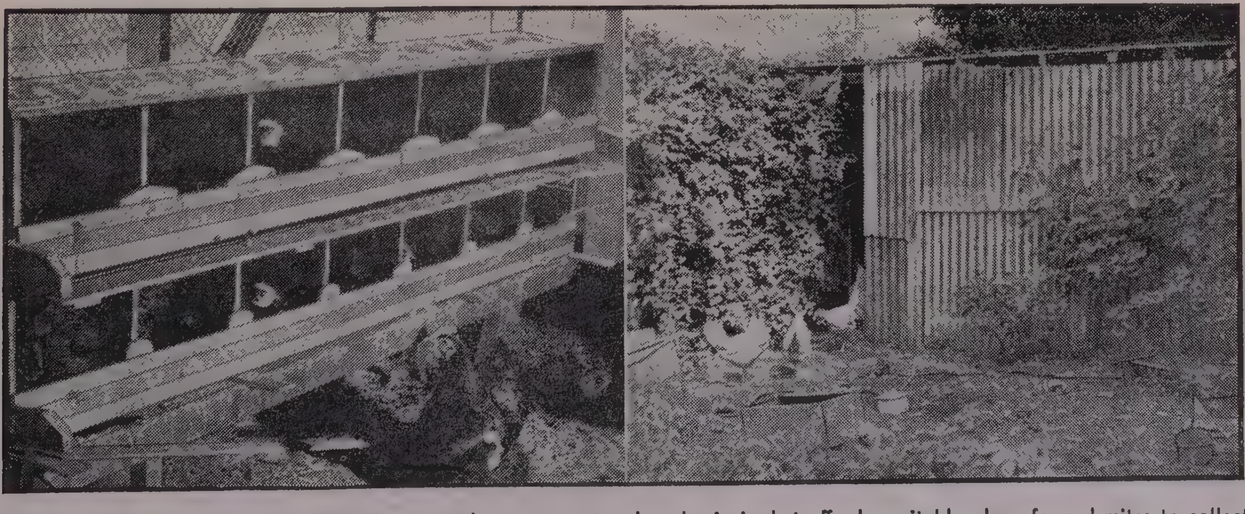
Diseases from infected stock are quite easily introduced despite any precautions by the purchaser. Nearly all diseases have an incubation period; that is, a more or less definite time from the entry of the organism into the body until the appearance of the first symptoms indicating that the bird is diseased. Stock may have been purchased and moved on to the farm in that period. Often young stock will develop disease in a chronic form, but because of excellent feed and hygiene the trouble will not be obvious to the inexperienced. Later, if adverse conditions occur, the disease may become active.

Household poultry keepers do not usually know sufficient of the symptoms of various diseases to be able to say whether birds are affected or not, and consequently diseased birds are unwittingly introduced into the flock. Birds should be carefully examined to see that they are healthy before they are purchased. Where doubts exist the birds should not be accepted but should be returned to the seller.

Sound hygiene with poultry is very important if continued success is to be looked for by the poultry keeper. The care of sick birds is not always possible and is rarely profitable, since those that recover seldom regain the vigour which they formerly possessed. Every endeavour should therefore be made to prevent disease with sound management and sanitation. Whenever stock are kept under more or less confined conditions the question of good hygiene becomes one of first importance.

Housing

Soundly constructed and ventilated houses are essential if the best results are to be obtained from the flock.



Left—Droppings collected on top of these nest boxes are not only unhygienic, but afford a suitable place for red mites to collect under the dried droppings. Right—Thoroughly unhygienic conditions in an outside run which are likely to cause an outbreak of disease. The poultry house shown lacks light and ventilation.

Birds living under damp and draughty conditions cannot be profitable and are most likely to become victims of colds and other diseases. Dry floors are essential in all poultry houses and for this reason the site selected for the fowl house should be on a rise of ground where good drainage is available. Household poultry keepers cannot always avail themselves of these conditions, but by sound construction a dry floor should not be hard to provide for the poultry. A properly laid cement floor is safe, sanitary, and permanent. A concrete floor is cold, particularly during winter, and thus 4in. to 6in. of good dry litter should be maintained at all times.

Overcrowding must be avoided. Poultry kept on the intensive system should have a minimum of 4 sq. ft. of floor space per bird, and the house should be high enough to provide good ventilation and freedom of movement when the poultry keeper is moving among the stock. The front of the shed should be at least 7ft. high for a small house, sloping to 6ft. at the back. Approximately 8in. to 10in. of perch should be available for each bird. Perches should be 15in. to 18in. apart, all on one level, and not more than 3ft. from the floor. Ventilation should be provided for by at least a 4in. baffled opening the full length of the house at the back close to the roof. All perches should be movable so that cleaning and spraying can be performed thoroughly and quickly.

Cleaning and Disinfecting

All poultry houses and equipment should be subjected regularly to the most thorough cleaning and disinfection. Washing soda at the strength of a double handful to a bucket of water is a detergent which is very effective for this purpose. A most important operation is the control of red mite. They are not hard to kill, but it is often difficult to get at their hiding places. Creosote, sump oil, kerosene, or a solution of D.D.T. has proved effective against red mite. Individual birds affected with body lice may be dusted with sodium fluoride. When many fowls are running continuously on the same land the ground becomes contaminated and the result is often an outbreak of disease. If the run is limed heavily in autumn and turned over, the soil will not become sour. Outside runs are not necessary for laying birds and should not be used unless of sufficient size to remain fresh and green the year round.

Where only a very small run can be provided for household poultry the intensive system is far more satisfactory. The birds will lay more eggs during winter than those in cold, muddy runs. In addition the incidence of disease will be considerably lowered.

Precautions against Disease

Important precautions against diseases of poultry are listed below.

1. All chickens should come from breeding stock which has been blood tested for pullorum disease.

2. The parent stock should be healthy, vigorous birds and of a reasonable size. White Leghorn breeding hens should weigh at least 5lb. and Australorps and Rhodes Island Reds should be over 6lb.

3. The litter should be kept dry, particularly round the drinking vessels.

4. Outside runs should not be allowed to become stale or fowl sick. If they do, they will encourage coccidiosis and roundworms.

5. The perches and surrounding woodwork should be inspected regularly for red mite. This parasite will not only cause production to slump, but will lower the resistance of the flock to disease.

Correspondence Courses in Agriculture

CORRESPONDENCE courses in agricultural subjects are provided by two correspondence schools of the New Zealand Department of Education in Wellington for two classes of students in any part of New Zealand who cannot attend day or evening classes in their locality. These schools are the Correspondence School and the Technical Correspondence School.

THE Correspondence School provides post-primary courses in agriculture up to School Certificate standard for both full-time and part-time pupils. Applicants for courses who have had no agricultural experience or have not previously taken agricultural subjects should apply for one of the introductory courses listed below as available from the Correspondence School. The Technical Correspondence School enrols part-time students for courses relating to the branch of agriculture or horticulture in which they are engaged.

Free post-primary education for 5 years or until the end of the year in which he or she reaches the age of 19 (whichever is the longer) is granted to every person in New Zealand. Applicants for correspondence courses who have not completed a 5-year period of free post-primary education are therefore entitled to receive their courses free until they have completed that period. Students who already have had 5 years' free post-primary education have to pay fees for courses at both correspondence schools, but these fees are low and text-books may be hired.

Details of the courses available from the two schools follow. Further information may be obtained from the Headmaster, Correspondence School, Clifton Terrace, Wellington, or the Principal, Technical Correspondence School, 29 Wallace Street, Wellington.

Correspondence School Courses

Farm Practice

A 1-year course dealing briefly with the more important branches of New Zealand's agriculture. This course is used as an introduction to the agricultural subjects of School Certificate, but it is also suitable for general study by pupils and adults interested in farming in New Zealand.

School Certificate Subjects

General agriculture. A 2-year course covering how a plant grows, seed certification; soils, fertilisers, and manures; crops and pastures; the main types of plant and animal life of interest to the farmer.

Animal husbandry. A 2-year course covering the cow, pig, horse, and sheep; principal breeds; current economic problems in stock farming; wool; pastures and their management; supplementary crops; genetics; physiology and diseases.

Dairying. A 2-year course covering milk, cream, butter, and cheese; their production and distribution; herd testing and improvement; care and management of cattle; use of dairy products.

Biology. A 2-year course covering the form and function of plants and animals in relation to their environments.

Horticulture. A 2-year course covering plant form, function, and growth in relation to gardening matters.

The School Certificate subjects may also be taken for general knowledge by non-examination pupils. Any number of the above courses can be studied at the same time and provision is made for both written and practical work.

Subjects for Junior Examination of National Diploma in Agriculture

Chemistry.
Bookkeeping.

Other subjects of this course may be obtained from the Technical Correspondence School.

Technical Correspondence School Courses

Agriculture

Dairy Farming

Principles of animal production.
Principles of animal nutrition.
Grasslands of New Zealand.
Dairy farming I.
Dairy farming II.

Sheep Farming

Principles of animal production.
Principles of animal nutrition.
Grasslands of New Zealand.
Wool.

Arable Farming

Crops and cropping.
Arable farming in New Zealand.

Short Courses

Farm bookkeeping.
Milk.
Concrete for the home and the farm.

Horticulture

Courses for National Diploma of Horticulture*

Junior examination: Horticultural botany; principles of plant protection.

Intermediate examination: Principles of botanical classification; principles and practice of horticulture; surveying, levelling, and drainage.

Market Gardeners' Certificate: Commercial gardening.

* Examinations conducted by the Royal New Zealand Institute of Horticulture.

Short Courses

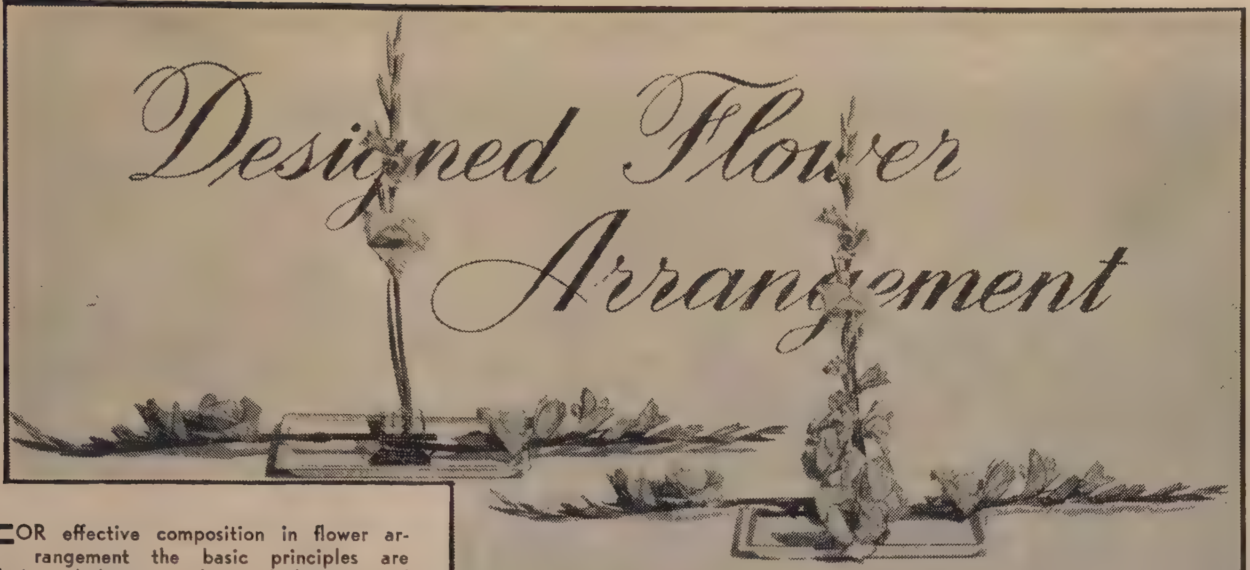
Fruit growing.
Introduction to forestry.
Practical horticulture.

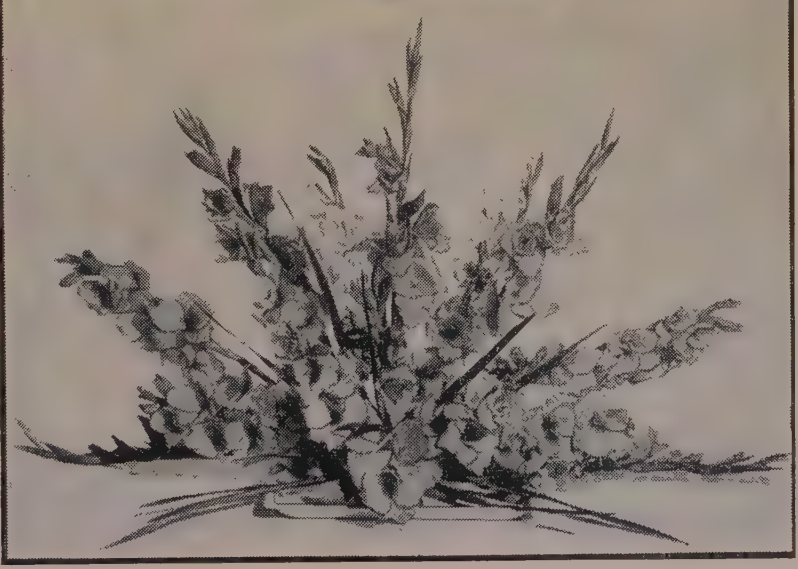
Dairy Manufactures

Courses for the Dairy Factory Managers' Registration Board Examination

Buttermaking.
Cheesemaking.
Dairy factory management.
Milk.
Steam boilers and steam engines.

Designed Flower Arrangement





[Perry

A formal arrangement for a modern setting. Upper left—The first three lines form the outline of a regular-sided triangle. A cage holder is most suitable for holding thick-stemmed, heavy-headed flowers on these angles. Upper right—The outline plus the focal point, which is made up of two or three large, deeply coloured gladioli florets cut on short lengths of the main stem and placed well forward on a needle holder. Lower—The completed formal arrangement. The gladioli spikes used to fill in have been placed symmetrically on each side of the primary line. The addition of gladioli foliage adds depth and interest to the design.

FOR effective composition in flower arrangement the basic principles are design, balance, scale, and harmony of colour, and the application of these principles to composition generally and to profuse, informal designs particularly was described in last month's "Journal" by Margaret O'Brien, Horticultural Department, Massey Agricultural College, Palmerston North, in continuation of her series of articles on designed flower arrangement. Here she continues her discussion on composition with a description of the application of these principles to the making of formal and semi-formal designs. The choice of colour will be discussed in a later issue.

DESIGN in relation to informal arrangements in low, open containers has been considered, and its application to other arrangements can now be discussed.

FORMAL AND SEMI-FORMAL DESIGNS

Formal designs may call for shallow, wide containers or for taller, upright ones; semi-formal designs without exception require tall containers, thus introducing the "tall vase" problem which so frequently presents difficulties.

Formal or Symmetric Designs

Formal designs, as the name suggests, are inclined to be stiff and less natural; hence their use is strictly limited to formal settings, for example, the centre of a formal mantelpiece, the centre of a buffet table placed against a wall, the centre of a piece of furniture occupying the middle of a wall, or on a grand scale the centre-back of a stage.

For a modern formal arrangement the outline is made up of three lines, as described for different arrangements last month, but this time forming a regular triangle. As always the highest line must be positioned first, and in this arrangement with the tip immediately over the base. The length of this line is the length plus the width of a low, open container. It is placed firmly on the centre-back of a holder, which is also centre-back in the container; the second and third lines are of equal length and size, thus making a formal pair. They may be the same length as the primary line or a little less; placed on either side of the primary line they form the base of the regular triangle.

This is the only type of design where it is essential to place the focal point exactly in the centre, and as formal arrangements are often for spacious settings, requiring considerable height, with corresponding width and depth, two holders can be used to advantage, one in front of the other, provided all the material is so arranged that it appears to radiate from one focal point only. The material for filling in must be sorted into pairs and placed accordingly.

The container for such a design will also be formal and symmetrical—a tray or trough with even sides and deep enough to ensure that all the stem ends are covered with water. If accessories such as ornaments or candlesticks are to be used as part of the complete picture, they too must be in pairs.

Period Formal Design

Though similar to modern formal design, period formal design is adapted

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to suit a period setting and container. "Period arrangement" is a convenient, if rather all-embracing, term. Is the "period" Empire, Victorian, Georgian, or Renaissance? Space does not permit of a detailed study of these variations, but it is a fascinating pastime for those who delve into it more deeply, and essential for those who possess furnishings representative of any particular period. However, for formal period arrangements in general the container must be reasonably antique and must, if it has handles at all, possess a symmetrical pair.

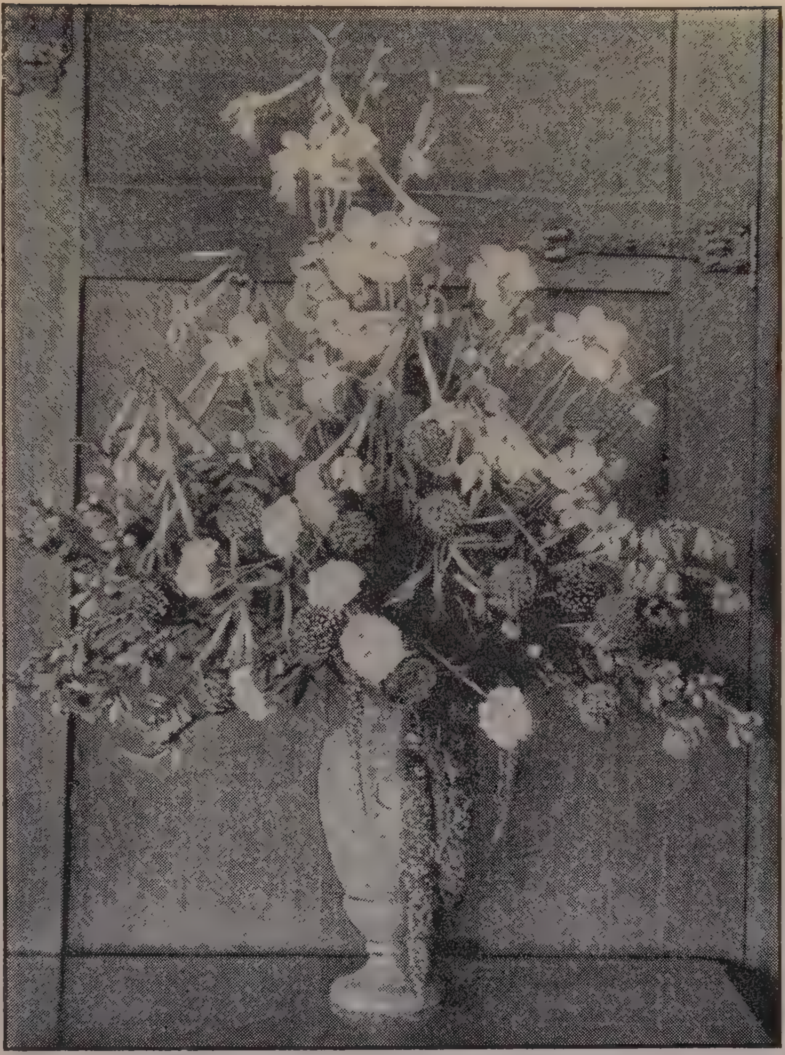
Outline

The outlines for these arrangements are usually well "lined" branches or heavy spikes of perennials. At this point comes a difference from other arrangements which have been described. It is in the measurement of the first line, the line of height. The antique container is sure to be tall compared with the low, wide, open containers already considered. For a period formal design the line of height is approximately one and a half times the height of the container. If it is a straight line, it is placed vertically, and if a curved line, the tip must be poised over the base. This rule for the line of height applies to arrangements in all upright or "tall" containers. For this formal period design the second and third lines are equal to one another and usually a little less than the primary line in length. The focal point comes forward and well down over the rim of the container, thereby tying the arrangement and container together and also breaking the hard line of the container's rim.

Filling in

The filling in is usually a massed effect of carefully grouped flowers. The importance of grouping flowers rather than mixing them was mentioned in connection with profuse informal arrangements. This massed formal arrangement is another example of the effectiveness of careful grouping—not stiff, sharply defined groups, but rather something akin to drifts of plants naturalised in wild borders or woodland settings. These groups emphasise the forms and textures of the flowers of which they are composed, whereas such flowers mixed at random tend to lose their individuality and distinctive colour value. In general any mass design depends on its outline and its colour scheme for its effectiveness. Obviously each flower cannot be displayed as in informal line arrangements, but by careful grouping, not necessarily with all the flowers of one kind in one group (they may be in several groups in a large piece), much can be done to introduce pleasing associations or striking contrasts.

In the formal period design illustrated on this page white and greeny-white nicotianas form the high line and deep wine-red nicotianas the equal lines at the base of the arrangement. The focal point is a group of purple-red pom-pom dahlias beneath which hang wine trails of *Amaranthus caudatus* (love-lies-bleeding). Carrying up the colour from the focal point is a group of lavender-pink pom-pom dahlias merging into tall, white Japanese anemones. The filling in at the sides is of nicotianas grouped from wine-pink blooms to pale pink ones, finally merging with the white nicotianas and white Japanese anemones at the top. The tall, slim container is of off-white, opaque Venetian glass, with a raised white design on its surface.



A formal period arrangement in a tall antique container.

Semi-formal or Mass-line Designs

The delightfully vague terms semi-formal or mass-line cover a much used combination of line and mass designs whose variations are numberless. It is the tall-container counterpart of the classical Japanese line design in a low, wide container. The setting and occasion will determine how formal or informal such a design is to be.

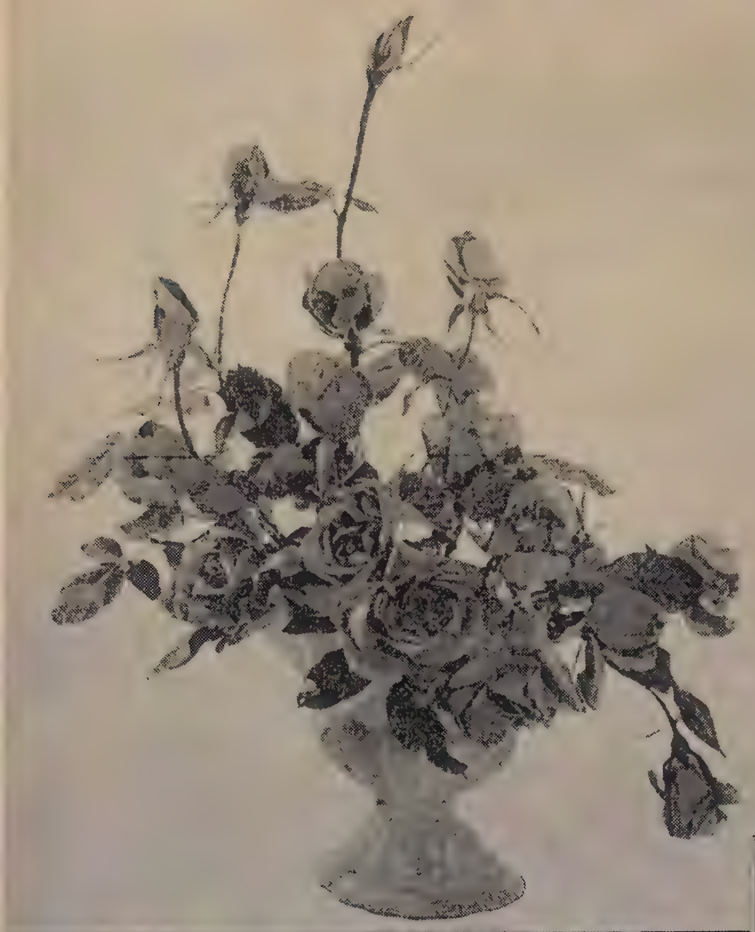
Outline

The line of height is approximately one and a half times the height of the container, but in very tall containers it may be twice the height or even a little more. The second line is swept up toward the tip of the first and may merge with it in the more massive of such arrangements or may remain a distinct entity in lighter arrangements. On the opposite side of the primary line the third line curves down over the edge of the container to balance the upswept curve of the second line.

The length of this third line is impossible to define exactly. The necessary length for good balance is often about half the height of the container; it may be longer if the material is light, and considerably less if the material is heavy leaves and deeply coloured flowers, as it often is.

Filling in

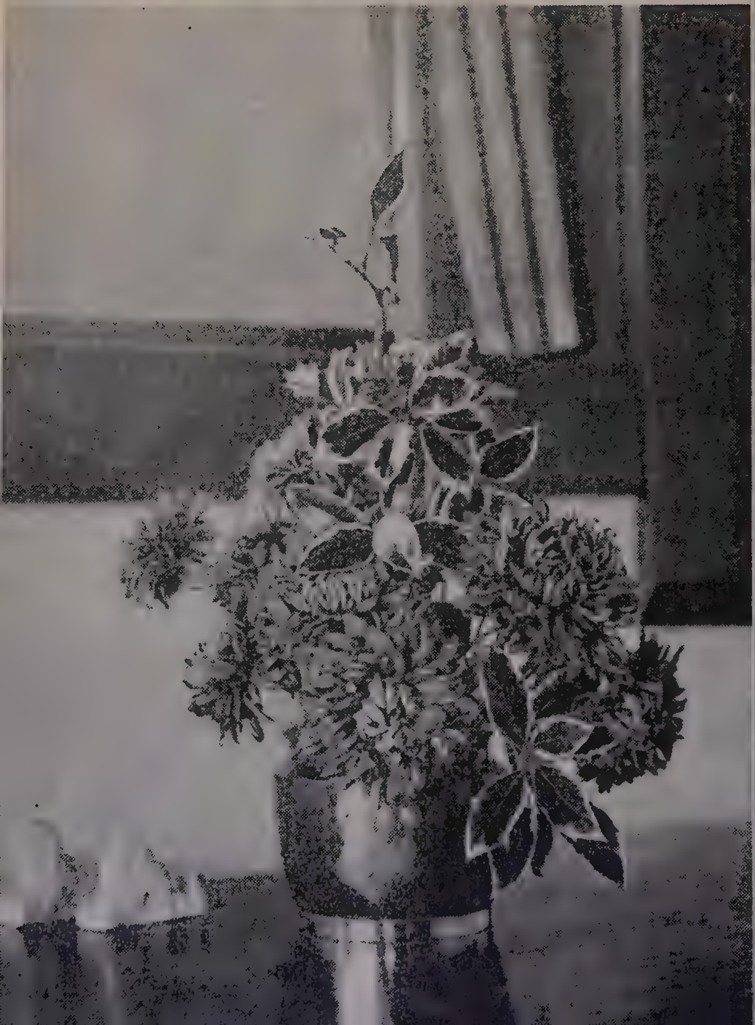
The focal point is usually more effective if placed slightly off centre, inclining toward the low, third line. If the emphasis is to be on "line", the filling will be lighter and will follow closely in line and colour the already established outline, but if something more massive is required, the filling

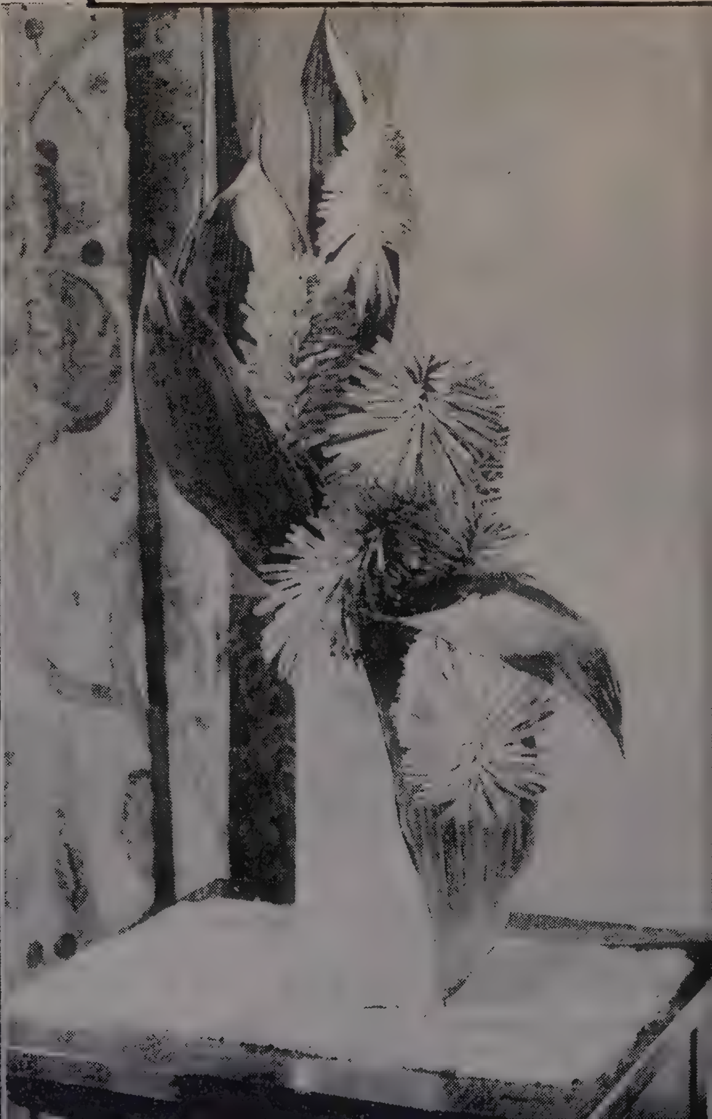


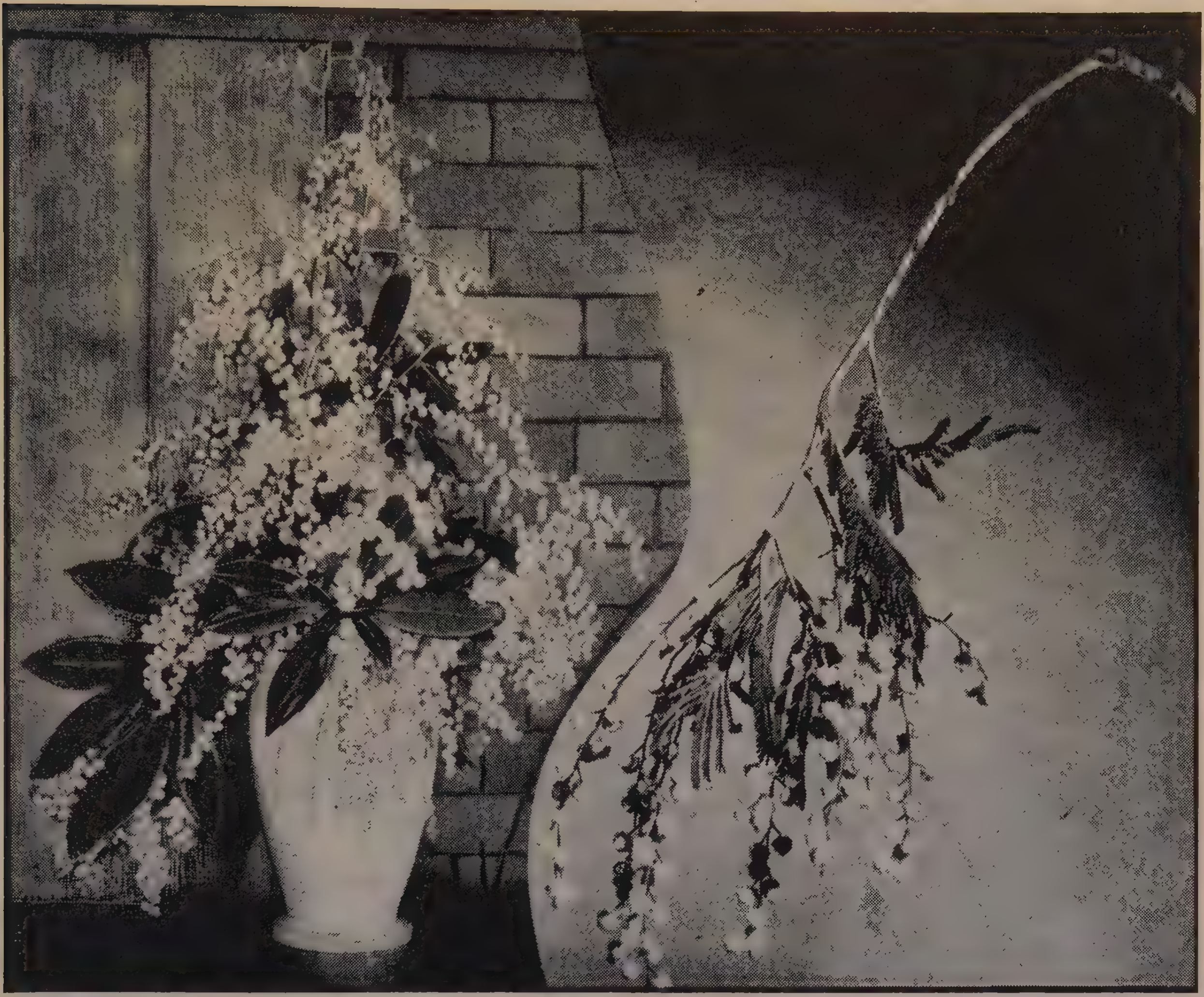
SEMI-FORMAL ARRANGEMENTS

At left—A semi-formal or mass-line design of roses. The line of height, one and a half times the height of the container measured from the rim, is made by the slimmest bud. The second line, half the height of the first, is made by the third bud on the left of the primary line. The third line is swept low on the right of the primary line. Fully open flowers and large leaves form the focal point and carry the weight down on the lower side of the arrangement. Below—This more upright semi-formal design repeats the line of the tall, straight pillar vase. The bold outline is formed by clear-cut aspidistra leaves. The red hot pokers, as focal point and filling, again emphasise strong, simple lines. Lower left—A rounded, substantial biscuit barrel was selected as a container for heavy, round chrysanthemums. The emphasis is therefore more on mass than line, but the completed arrangement is still a triangle with height on one side balanced by a low, heavy line on the other side.

Photograph at upper left by Perry







[*Perry*

An arrangement with wattle and rhododendron leaves. Left—The high line of wattle is twice the height of the container. The second line is merged with the first on the right, and the third hangs low on the left. The line of the design is repeated in smooth, dark green rhododendron leaves, contrasting with the fluffy, soft yellow wattle flowers. Right—The third line of the wattle was picked with a portion of the previous year's wood, which forms almost a right angle, making its placement very easy and ensuring that the cut end is well in the water. A little forethought and planning of the design was obviously necessary before the actual picking of the material, but time spent on this is amply repaid by the ease of quick placement later.

will be heavier, depending more on colour than on line and form for effect. In this last class come the charming American colonial pieces, designed to suit the stately "colonial homes".

Pruning

In the construction of any of the larger arrangements a little judicious pruning as the design progresses can make a great difference to the final effect. The importance of main lines being clearly defined and not confused has already been discussed, but often lesser lines become confused and cluttered up during filling in, especially in more massive arrangements. A leaf may persist in turning inside-out, a twig may cut across the line of the next branch, or leaves lower down on stems may well need thinning out. Any pruning on these lines must be done with a neat, clean cut which will not leave ugly snags or torn bark showing. To carry this idea too far and to cut leaves down to bare midribs to achieve an original line is to deviate too sharply from the natural. Such work falls into much the same category as the tying of iris leaves in bows; in fact the quest for originality has merely resulted in the grotesque.

Balance and Scale

In all these arrangements the laws of balance and scale are closely interwoven with the actual principles of design. An arrangement that is top heavy, or appears to be so, or one that is out of scale is not restful to look at. In this connection visual weight is most important. Leaves and flowers which are heavier than the other components, or appear so because of their greater colour value, must come low in any arrangement to give stability at the base. Further, where height is added on one side of a first line of height, weight and width must be added on the other side for balance. This is demonstrated by a pair of household scales: If weight is added on one side, the arm on the other side goes up until it reaches the point of balance again. Thus tall branches and tapering ends on one side are balanced by shorter, wider lines of heavier leaves and larger flowers on the other. The placement of colour quickly influences the visual conception of balance, and this aspect will be discussed in a later issue of the "Journal".

Scale is difficult to define apart from balance, but it could be said that scale has reference to relative size rather than to placement. Lack of scale would be well illustrated in an arrangement of five arum lilies high up and a few fine fern leaves beneath. Not only is scale an important factor within individual arrangements; it also has a bearing on the general surroundings or furnishings. For instance an arrangement of primroses on a grand piano or an armful of gladioli in a tiny room would be completely out of proportion.

Harmony

Harmony is an elusive factor, even more difficult than scale to define in words, but its effectiveness is well known to those who achieve it. Colour and texture are involved in harmony (colour will be discussed later). Texture is best illustrated by example. The fine surfaces of *Lilium* petals, camellias, and roses harmonise perfectly with silver or fine porcelain and would look well on a highly polished table or on fine linen. Zinnias, bold in colour and texture, arranged in a wicker basket on a cottage-weave cloth would be a sharp contrast to the fine textures of the other flowers named. The choice of containers may not be wide, but generally plain, smoothly finished containers combine easily with the majority of better-quality flowers. The third factor of background and surroundings also plays an important part in completing the final harmony; such settings as the modern sunroom and the drawing-room of an old home demand arrangements diametrically opposed to one another in design and in harmony.

In a discussion on harmony it is fitting to point out that maiden-hair fern has lost its popularity; and rightly so, as the trend of flower arrangement today is toward that which is natural and simple. A flower's own foliage is its best foil; if this is not available, something which has a likely association should be used. Maiden-hair fern does not grow in natural association with New Zealand garden plants, but the so-called native maiden-hair would be quite suitable in a group composed of plants gathered from the bush.

Horizontal Arrangements

The flower arrangements discussed so far have been vertical. Obviously many settings call for a horizontal design, one that can be looked down on, suitable for a dining table, a low chest, or a low shelf. As the general principles for these are similar to those for upright arrangements, the actual construction will be dealt with in the article on table arrangements in the May issue of the "Journal".

Working Methods

The place in which flowers are arranged is important, as it is much easier to get proportions accurately in scale with the immediate surroundings if the arranging is done in situ rather than on the kitchen table. If an arrangement is correctly and firmly put together, it should easily withstand being carried from one room to another, but however familiar one may be with the surroundings, a design fits into the completed picture more exactly when it is done in its final position.

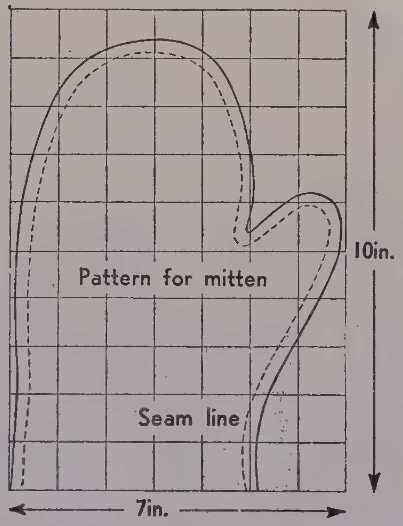
A simple method for protecting furniture during flower arranging is to use a sheet of plastic or even strong paper beneath the container and when finished to slip it out complete with any bits and pieces that have been pruned off or any dust and pollen which may have been shed from the flowers. There should be no danger of splashing water about, as the flowers, if correctly handled, will be dry. Water should not be put in the container until the arrangement is finished. One reason for this is the necessity for keeping frail petal surfaces dry, which would be difficult if wet stems were being taken in and out of deep water in an upright container; another reason where wide-open, low containers are used, is that pollen and other scraps floating on the surface of the water detract considerably from the freshness of the finished picture; without the water dust is easily blown out of a low container.

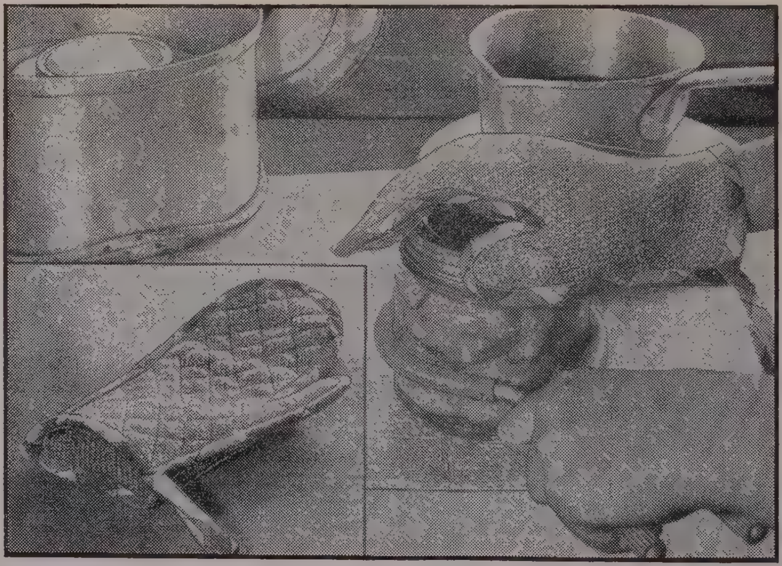
To fill a container which already has a quantity of stems in it a vessel which pours easily must be used; a small "flower-can" is the elegant thing to use, but a kettle serves just as well.

A Mitten to Prevent Burnt Hands

During the preserving season many people find they develop rather painful hands from constant screwing on of hot lids and handling of hot jars. The mitten illustrated will give adequate protection without restricting the movement of the wearer's hand in the way a cloth sometimes does. It is very simply made from odd scraps of material.

Cut three pieces of the mitten shape from stout material such as burlap, poplin, or sacking. Then cut two more pieces from flannel for the padding. If preferred, a thin layer of wadding may be used.



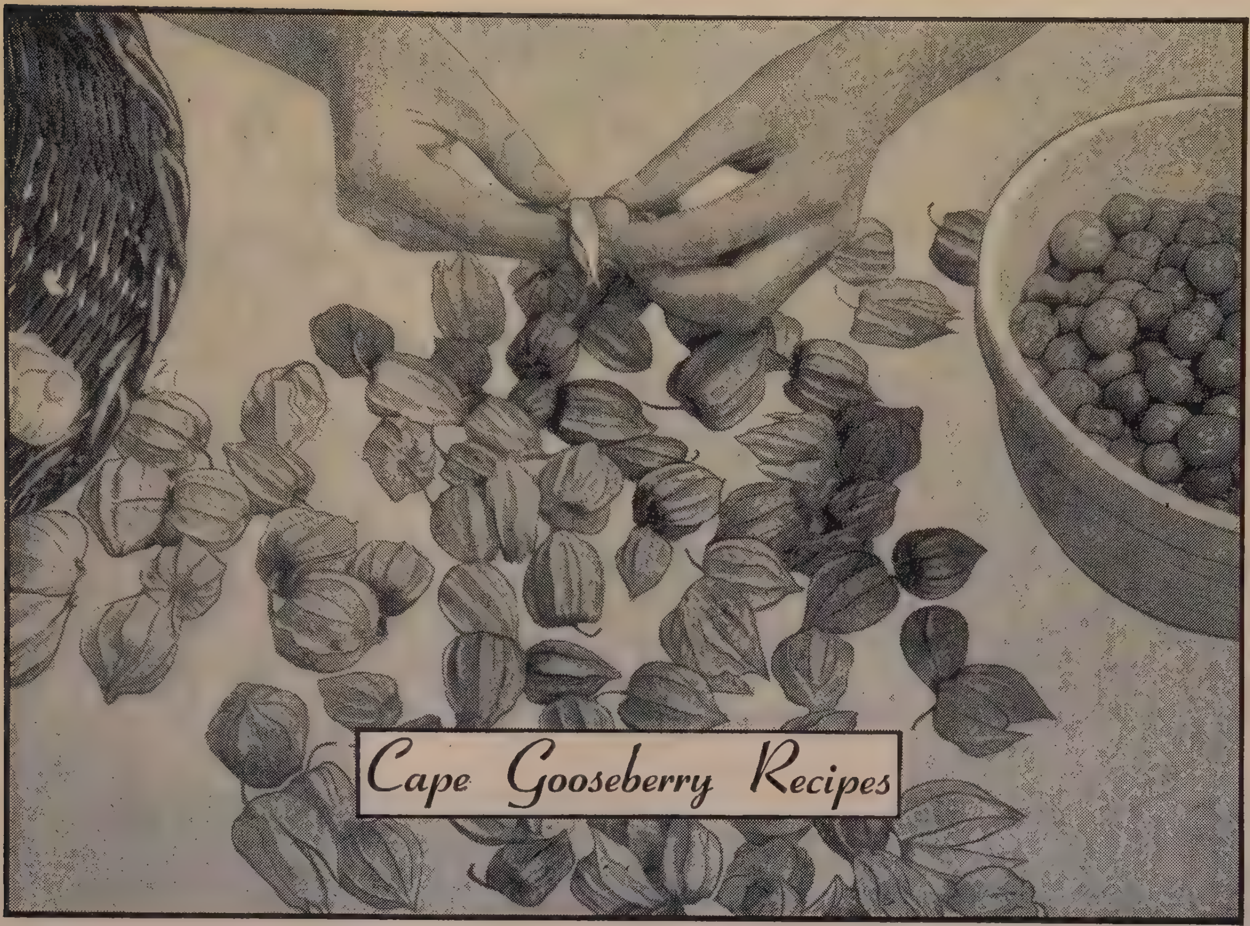


[*Sparrow*

The mitten in use. Inset—The palm of the mitten.

Place the padding between the two layers of the covering to be used for the palm and tack them together before machine stitching across to quilt all together. Place the third piece of material on this and bind round the entire mitten with bias binding. So that the mitten may be hung on a peg within easy reach a loop of the binding may be made at the wrist edge.

—DAPHNE EILERS, Field Officer in Rural Sociology,
Department of Agriculture, Auckland



Cape Gooseberry Recipes

THE cape gooseberry is easily grown in districts where tomatoes can be grown successfully outdoors, but it is frost tender. It is an annual, but once it is in a garden seedlings will come up year after year. They grow about 3ft. high and may be cultivated in rows, which makes for easier picking of the heavy crop. In those parts of New Zealand where cape gooseberries grow well the housewife is sometimes embarrassed by the quantity of berries in the garden, and a variety of ways of using cape gooseberries is described in this article by Nell Macpherson, Field Officer in Rural Sociology, Department of Agriculture, Auckland.

A NATIVE of Peru, the cape gooseberry has been cultivated in Europe for more than two centuries. It was cultivated in the settlement at the Cape of Good Hope and according to a writer of the early 19th century it was known as the cape gooseberry in New South Wales, where ". . . it is the chief fruit the colonists at present possess; is eaten raw, or made into pies, puddings, or preserves".

The fruits, which are a golden yellow when ripe and are enclosed in a husk of sepals, ripen between the middle of February and the middle of April. To prepare the fruit either for the table or for cooking the husk must first be removed.

Cape gooseberries may be served raw as dessert or they may be quartered or sliced into either vegetable or fruit salads. A handful may be packed with the children's school lunches, where they provide a change while giving the children some fresh fruit for lunch.

The berries can be stewed, preserved, or made into jam, conserve, or chutney, but their main use is probably in puddings. In the recipes given for puddings preserved fruits may be used instead of fresh fruits except where otherwise stated.

Puddings

Layer Pudding

1 cup of rice
½ teaspoon of salt
2 tablespoons of golden syrup
2 cups of husked cape gooseberries
1 tablespoon of brown sugar

Cook the rice in salted water until it is soft. Strain it and stir in the golden syrup. Grease a baking dish. Put alternate layers of rice and cape gooseberries in the dish, finishing with a layer of cape gooseberries. Sprinkle the brown sugar over the top and bake in a moderate oven (350 degrees F.) until the cape gooseberries just split their skins. Six to eight servings.

Cape Gooseberry Special

Meringue Shell

3 egg whites
¼ teaspoon of salt
¾ cup of sugar
¾ teaspoon of vanilla

Beat the egg whites and salt until they are stiff. Gradually beat in the sugar 1 tablespoon at a time. Add the vanilla last. Spread two-thirds of the meringue in a circle ½in. thick on a piece of greased greaseproof paper. Build up the sides with an icing forcer fitted with the rose nozzle. Bake in a slow oven (225 degrees F.) for 2 hours or until dry. (This shell may be stored for some days in a warm, dry place.)

Filling

3 tablespoons of lemon juice
Juice and grated rind of 1 orange
½ cup of honey
¼ teaspoon of salt
1 tablespoon of flour
1 tablespoon of butter
⅔ cup of water
2 cups of cape gooseberries

Melt the butter in a saucepan, add the flour, and cook until thick but not brown. Add the water carefully and bring to the boil, stirring all the time. Remove the mixture from the heat, add the honey, lemon and orange juice, and salt, and blend well. Lastly add the grated orange rind and cape gooseberries. Cook until the cape gooseberries are soft. Thicken if necessary with cornflour. Allow to cool and then spoon it into the meringue shell. Six to eight servings.

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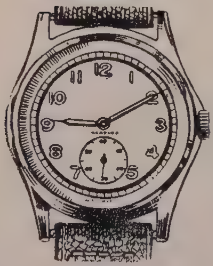

No. 6. — SWISS-MADE LEVER; dustproof and shockproof; antimagnetic; very reliable time piece; small second hand; luminous dial; leather strap; unbreakable glasss; very practical design; 12 months' guarantee. £5/17/6.

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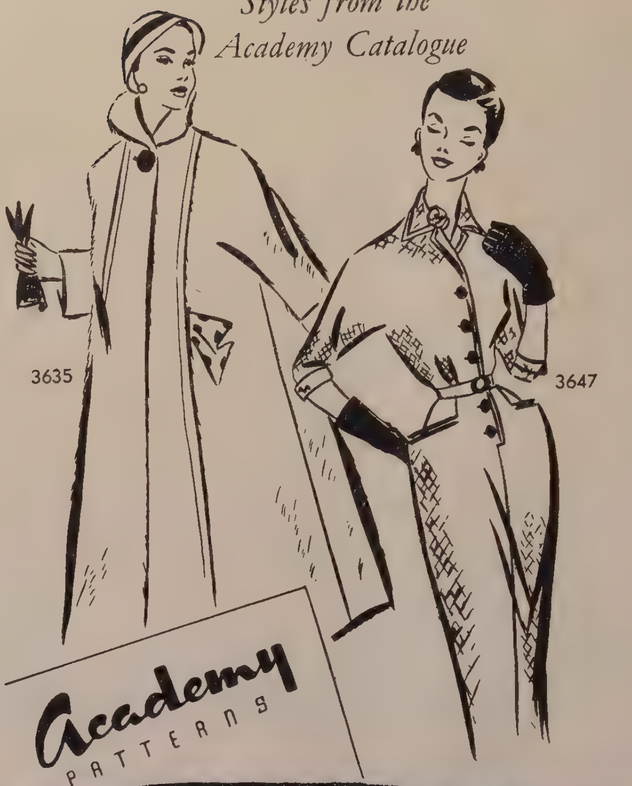

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Cape Gooseberry Fluff

- 2 tablespoons of sugar
- 3 tablespoons of flour
- ¼ teaspoon of salt
- ⅔ cup of cape gooseberry juice
- 16 marshmallows
- 1 tablespoon of gelatine dissolved in ¼ cup of cold water
- 1 egg
- 1⅓ cups of stewed or preserved cape gooseberries
- 1 tablespoon of lemon juice
- 1 teaspoon of grated lemon rind
- ½ cup of whipped cream

Combine the sugar, flour, salt, and cape gooseberry juice and heat it over boiling water. Add chopped marshmallows and cook the mixture until it thickens. Beat the egg, fold it in, and cook for 2 to 3 minutes. Add the gelatine and blend thoroughly. Cool the mixture slightly. Pour it over the stewed or preserved gooseberries and lemon juice and rind. Fold in the whipped cream. Allow the mixture to cool thoroughly or chill it in a refrigerator for 20 to 30 minutes. Either pile it into a large dish or into individual dishes (6 servings). This makes an attractive sweet for a buffet lunch or dinner.

Cape Gooseberry Special

Hot Cape Gooseberry Pie

Short Pastry

- 8oz. of flour
- ½ teaspoon of salt
- 4oz. of fat

Filling

- 4 cups of cape gooseberries
- ¾ cup of sugar
- ¼ teaspoon of salt
- ¼ teaspoon of cinnamon
- 1 tablespoon of grated lemon rind
- ¼ teaspoon of nutmeg
- 3 tablespoons of lemon juice or 3 tablespoons of cape gooseberry juice, if preserved fruit is used

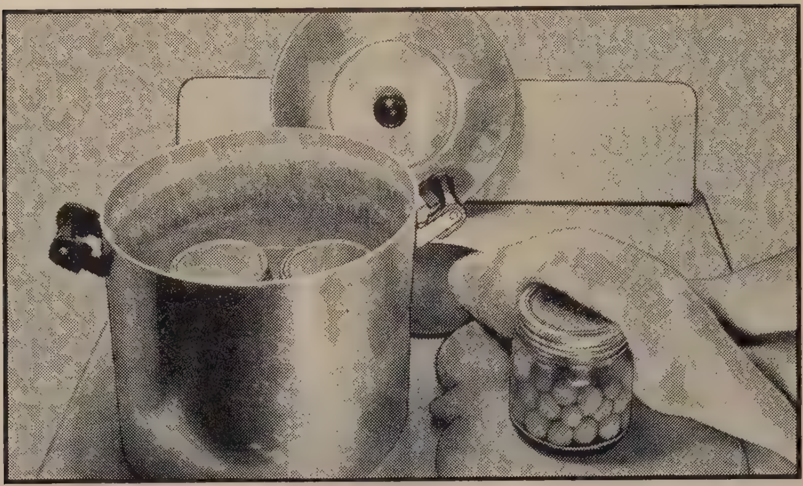
Pastry: Sift the flour and salt and chop in the fat. Add sufficient water to make a stiff dough. Cut this in halves, roll out half the pastry, and line a pie plate with it. When trimming the pastry leave ½in. border of pastry. Sprinkle a tablespoon of flour over the whole of the pastry. Mix the filling ingredients with a fork, mashing the cape gooseberries slightly. Spoon it into the pie shell. Cover the pie with the remainder of the pastry rolled out ¼in. thick and trim it. Moisten the ½in. border of pastry and fold it over the top layer. Crimp the edge with a spoon or fork. Cut several slits in the top pastry to allow steam to escape during cooking. Brush the top of the pie with milk. Bake in a hot oven (425 degrees F.) for 50 minutes. Six to eight servings.

Southport Pudding

- 3oz of breadcrumbs
- 1½oz. of butter or suet
- 1 egg
- 2 tablespoons of milk
- 1 teaspoon of baking powder
- 3oz of sugar
- 4oz. of cape gooseberries
- Grated rind of ½ lemon
- 2 tablespoons of flour

Mix all the dry ingredients. Add the cape gooseberries and lemon rind. Beat the egg and add it and the milk.

Cape Gooseberry Fluff



Cape gooseberries preserved by the water bath method.

Mix well. Put the mixture into a greased basin and steam for 1½ hours. Six servings.

Cape Gooseberry Pudding

1 cup of flour
1 teaspoon of baking powder
½ teaspoon of salt
Milk to mix
1 dessertspoon of sugar
2oz. of butter
½ cup of raw cape gooseberries

Sift the dry ingredients into a bowl and cut in the butter. Add the cape gooseberries and mix all to a soft dough with milk. Put the mixture into a greased basin and steam for 1 to 1½ hours. Six servings.

Cape gooseberries may also be used in roly-poly puddings, in steamed cottage puddings, in shortcakes, and in steamed suet puddings as the filling when the basin is lined and topped with a suet crust.

Preserves

Cape Gooseberry Jam

2lb. of husked cape gooseberries
2lb. of sugar
Juice of 2 lemons

Put the lemon juice in a greased jam pan and add the cape gooseberries. Heat gently while crushing the fruit with a potato masher. Cook until the berries are soft and pulpy. Add the warmed sugar, stir until it is dissolved, and then bring to the boil and boil hard until the jam gives the setting test. Pot, cover, and label it. The quantities shown make about 3 pints of jam.

This jam is a lovely golden yellow.

Cape Gooseberry and Lemon Conserve

1lb. of husked cape gooseberries
1 ripe lemon
1lb. of sugar
1 cup of water

Put the water and sugar in a greased jam pan and add the lemon sliced thinly as for marmalade. Bring to the boil and boil gently until the pith of the lemon starts to look clear. Add the cape gooseberries and boil the mixture until it will set. Allow the conserve to cool slightly and then stir it well. Pour it into sterilised jars and seal and label it. (The conserve is allowed to cool slightly and is stirred before potting because the fruit is likely to rise to the top of the jar.) The quantities shown make about 2 pints of conserve.

Cape Gooseberry Chutney

3lb. of husked cape gooseberries
3lb. of apples
1lb. of sliced onions
4oz. of lemon peel
8oz. of raisins
8oz. of sultanas
1 teaspoon of ground ginger
1 teaspoon of curry powder
2lb. of sugar
¼ teaspoon of cayenne pepper
1 tablespoon of salt
1 teaspoon of ground cloves
1 quart of vinegar

Peel, core, and quarter the apples. Put all the ingredients into a saucepan, bring the contents to the boil, and boil for 2 hours. Allow the chutney to cool slightly, pour it into jars, and cover them. The quantities shown make about 6 pints of chutney.

The quantities of curry powder, ginger, and cayenne pepper may be reduced for those who do not like hot chutney.

Cape Gooseberry Sauce

3lb. of husked cape gooseberries
1 pint of vinegar
1 teaspoon of salt
1 cup of brown sugar
½ teaspoon of pepper
1 teaspoon of peppercorns
1 large onion

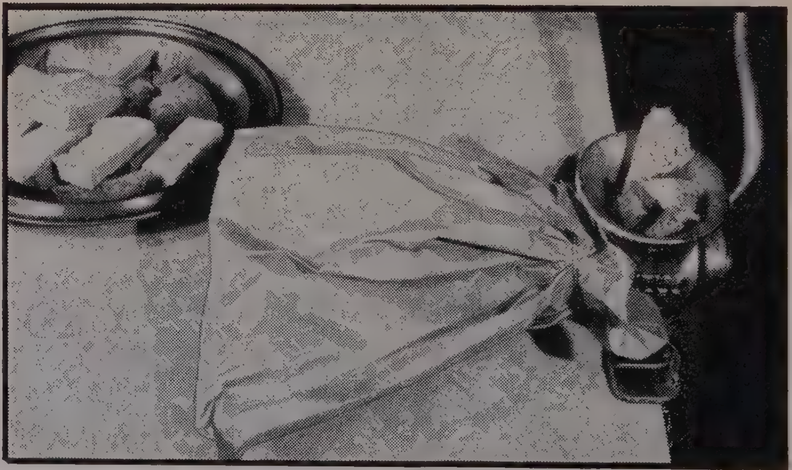
Peel the onion and slice it finely. Chop the cape gooseberries. Put all the ingredients in a saucepan and boil for 1 hour. Strain the sauce through a colander or wide-mesh sieve. Return the strained sauce to the saucepan and bring it to the boil. Boil for 2 to 3 minutes. If necessary, thicken the sauce with a little flour, but it must be boiled again for 5 minutes after being thickened. Pour the sauce into sterilised bottles and allow them to cool. Seal with melted paraffin wax. The sauce should be a clear golden colour. The quantities shown should make 4 to 6 bottles of sauce.

Preserving Cape Gooseberries

Make a syrup of 2 cups of water and 1 cup of sugar. Pack husked cape gooseberries into sterilised jars and cover them with the syrup, filling the jars to within ½in. of the tops. Put the lids on the jars according to the directions given with them. Place the jars in a water bath and bring to the boil. Boil gently for 25 minutes. Remove the jars immediately, allow them to cool away from draughts, and after 24 hours test the seals. The quantity of syrup is sufficient for 3 pint jars of fruit.

All photographs by Sparrow.

Making Dried Breadcrumbs

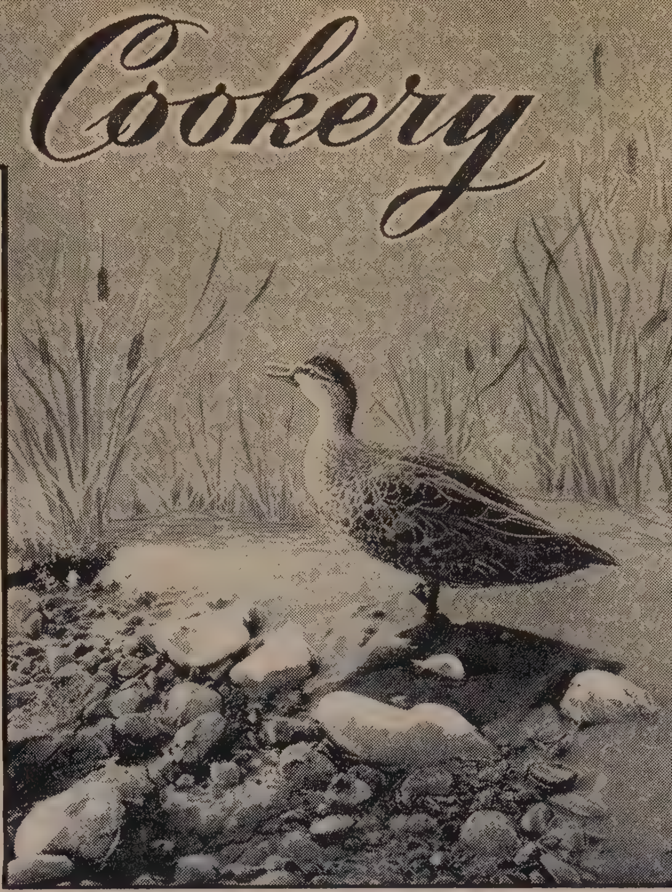


[*Oddies*

AN easy method of making dried breadcrumbs is to use the mincer with a paper or plastic bag tied over the mouth. The bag catches all the crumbs and they are not spilt over the bench or floor. Before the dried bread is minced care should be taken to see that it is thoroughly crisped; otherwise it may block the mincer. After they have been minced the crumbs should be shaken through a sieve and stored in an air-tight jar. They are then ready for use when required for coating ham or for coating fish, croquettes, or other foods which are to be fried.

—*ELEANOR COUSTON, Field Officer in Rural Sociology,*
Department of Agriculture, Timaru

Game Cookery



EACH shooting season finds some housewives confronted with unfamiliar birds and animals brought in to be cooked. The cooking and serving of game and its various stuffings and accompaniments are not well known. This article by Betty M. Johnston, Field Officer in Rural Sociology, Department of Agriculture, Wellington, gives recipes for those wild birds and animals which are allowed to be killed in New Zealand.

MRS. BEETON may or may not have said "First catch your hare" as a preface to her directions for cooking a hare, but to have the recipes before the game arrives saves the cook some anxious moments.

Into many country homes, and into town ones too, during the shooting season will come not only hare but duck, cock pheasant, quail, and black swan, and occasionally, venison and wild pork. The usual stuffings and service of game birds and animals may not be widely known, and to some people the prospect of cooking something strange for the first time may be disconcerting.

Many of the recipes include herbs, some of them familiar to all gardeners and others which are less well known. The bouquet garni described in this article is a small bunch of herbs, usually sprigs of parsley and thyme, and a bay leaf, though other herbs such as mint, sage, tarragon, yarrow, sorrel, savoury, and marjoram may be included. These herbs, all of which may be grown in New Zealand, give a pleasing flavour to soups, gravies, and stuffings, but the stronger ones, for example sage, should be used sparingly. Wine also adds flavour to sauces and gravies.

Thick Soups

Hare Soup

In the recipe for hare soup given here the blood and bones of the animal are used with the flesh.

1 hare cut into small pieces
2 rashers of bacon
2 or 3 medium onions
4 pints of stock or water
2 tablespoons of flour
1 teaspoon of salt dripping
6 peppercorns
Bunch of herbs (sprig of parsley, sprig of thyme, and bay leaf, all tied in muslin)
½ pint of sherry or red wine
Blood of the hare

Fry the floured pieces of hare in a little dripping with the chopped bacon and onions. Add the stock or water and the salt; slowly bring the contents of the pot to the boil. Strain the soup, add the peppercorns and the herbs, and simmer the soup for 3 to 4 hours. Strain the soup. Remove the meat from the bones, mince it finely, and force it through a fine sieve. The puree is added to the stock, which is reheated and, if necessary, thickened with a little flour paste. Finally stir in the wine, reheat the soup, but do not boil it, and serve it very hot.

Brown Giblet Soup

1 carrot
1 medium onion
1 celery stalk
2 pints of water
1lb. of giblets
Pepper and salt to taste
Bouquet garni (bunch of herbs: Parsley, a bay leaf, thyme, and mint tied in a muslin bag)
1 tablespoon of flour
Dripping

Cut up the giblets and vegetables and brown them lightly in a little dripping. Add the water, salt, pepper, and bouquet garni. Simmer the soup for about 2 hours. Remove the bouquet garni, strain out the vegetables and meat, and force them through a sieve. Return the vegetable-meat puree to the soup. Thicken the soup with the flour mixed to a smooth paste with a little cold stock or water. Reheat the soup, seasoning it if necessary. Serve the soup while it is very hot, garnished with croutons.

A quart of soup should give 5 medium servings or 7 small ones.

Croutons or Sippets

Cut slices of stale white bread into small cubes. Half fill a small saucepan with clean dripping heated to smoking point. Drop in the bread cubes and fry them to a light golden brown. Drain the croutons on crumpled cooking paper. Serve them hot, either sprinkled on the soup or in a warmed bowl.

Thin Soups

Consomme or clear soup is usually made from 2 or 3 kinds of meat, including poultry, the proportions being 2lb. of poultry to 6 or 7lb. of other meat (either beef or veal). The soup is highly seasoned and it is always cleared, usually with egg white and shells.

Duck Soup

2lb. of duck bones and scraps of cold meat
4 pints of lukewarm water
2oz. of lean ham
1 teaspoon of salt
Pepper to taste
1 diced carrot
1 diced turnip
1 small, diced onion
1 stick of chopped celery
Sprig of thyme
6 peppercorns

The Stock

Soak the bones and meat scraps in warm, salted water in a saucepan for an hour. Slowly bring them to the boil, add a tablespoon of cold water, and remove the scum. Boil the stock for 5 minutes and finish skimming it. Add the vegetables and ham and the thyme and peppercorns and simmer them for 3 to 4 hours with the lid on the pot. Water may be added to replace evaporation losses. Remove the fat before using the stock to make soup.

Removing Fat from Stock

Remove the fat from cold stock as a solid cake. Small particles of fat may be removed from jellied stock by wiping the surface with a clean cloth wrung in cold water. Fat droplets may be removed from liquid stock by brushing the surface with a sheet of clean blotting paper. If the stock is warm, remove as much of the fat as possible by skimming and then running a small piece of ice wrapped in a clean cloth around the surface. Fat will stick to the cloth. Carefully strain the stock.

To Make Consomme

For making consomme to each quart of stock add:—

½lb. of lean veal
Whites and shells of 2 eggs
Thick slice each of onion, carrot, turnip, and celery
Salt to taste*
Bunch of herbs tied in a muslin bag
2 cloves
12 peppercorns
½ teaspoon of cayenne pepper
Lemon juice
½ teaspoon of thyme and bayleaf and a sprig of parsley

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* As soup tastes more highly seasoned when hot than it does when cool, add the salt with care.

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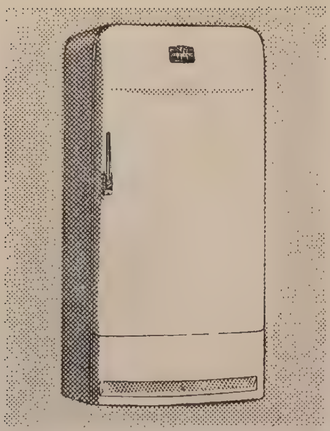
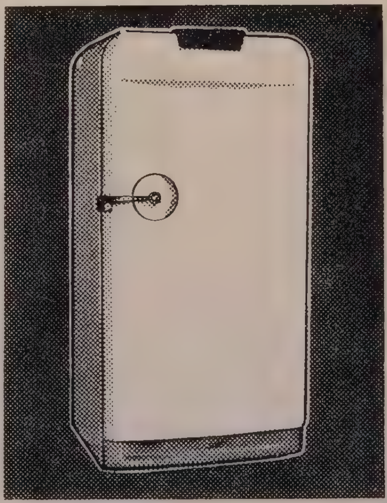


TOP: Compact 5.5 cu.ft. model, for the smaller family. "Meter-Miser" economy; Super Freezer; new type "Quickube" Ice Trays; Semi-automatic Defrosting.

CENTRE: The 7.4 cu.ft. model, offering more usable inside storage space with less outside size. "Meter-Miser" economy (uses less current than an ordinary light bulb) and other famous "Frigidaire" features.

FAR RIGHT: The 12 cu.ft. model, for the large family needing extra space. Double door for easy access to foods. "Meter-Miser" economy, etc.



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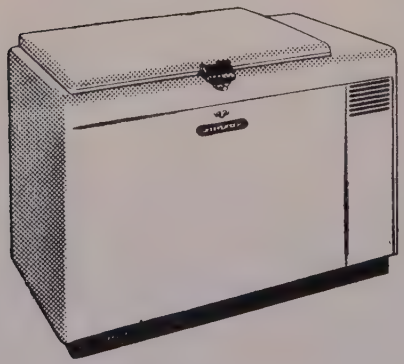

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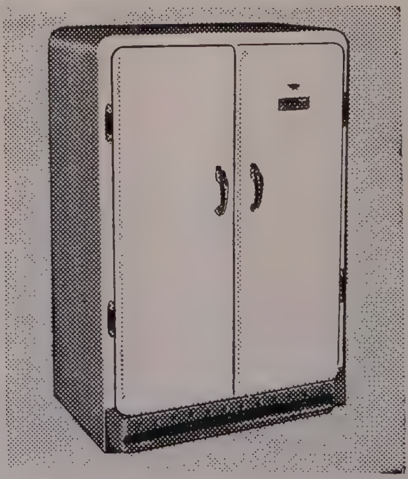

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Orange salad and potato chips are often accompaniments to game.

Mince the meat finely. Wash the egg shells and separate the yolks from the whites. Place all the ingredients in a large saucepan, seasoning them carefully with salt, cayenne pepper, and a squeeze of lemon juice. Whisk all the ingredients together over the heat until a light froth will remain on the surface (the temperature should be just below boiling point). Stop whisking and allow the soup to boil for 5 minutes, then turn down the heat or remove the pot to a cooler part of the stove and allow the soup to simmer gently for about 40 minutes. Remove the pot from the heat. Add ¼ cup of cold water and stand the soup aside for 10 minutes to allow it to settle. Carefully strain the soup through several layers of clean butter muslin. Remove any remaining fat with soft paper or clean blotting paper. Make up to the original quantity (1 quart) with boiling water and add more salt if necessary. Reheat the soup and serve it hot garnished with hot, cooked green peas, which have been well rinsed under hot, running water to remove any fine particles. One quart of soup is sufficient for 7 small servings or for 5 medium servings.

Consomme Neapolitaine

Any game—pheasant, quail, swan, rabbit, hare, or venison—may be used to make the first stock, and the soup is garnished with hot, well-rinsed macaroni and shreds of celery and ham.

Gibier St. Hubert

This is another game consomme garnished with hot, well-rinsed green peas and pea shapes of carrots, turnip, and celery.

Rabbit Recipes

Rabbit and Onion Casserole

Wipe the rabbit with a damp cloth. Cut it into pieces and brown them in butter in a casserole. Add about a dozen button onions and a small bouquet garni, but this is not essential. Season the rabbit with salt and pepper, put the lid on the dish, and bake the rabbit in a moderate oven until it is cooked (about 1 to 1¼ hours). Lift the lid occasionally and allow the steam to condense and run back into the casserole, thus forming gravy. Mushrooms or tomatoes may be added with small knobs of butter and pepper and salt ¼ hour before the casserole is served.

Roast Stuffed Rabbit

Wipe the rabbit with a damp cloth. Fill it with stuffing and sew up the flaps. Cut off the last joints of the legs and lightly slash the flesh at the shoulder joints. Skewer or tie the fore and hind legs together, keeping the hind legs to the outside. Skewer or stitch the neck. Place strips of bacon over the back of the rabbit or cover it with greased butter paper. Frequent basting during roasting is necessary to prevent the flesh from drying. Roast it at 450 degrees F. for 10 minutes and then reduce the temperature to 350 degrees F. for an hour. Remove the paper, skewers, and stitching threads before serving the rabbit.

Sage and Onion Stuffing

6 cups of bread crumbs
1 dessertspoon of salt
1 dessertspoon of mixed herbs
1 dessertspoon of chopped parsley
1 dessertspoon of chopped celery
Dash of pepper
2oz. of chopped onion
½ cup of dripping

Mix together the crumbs, salt, herbs, celery, and parsley. Simmer the onion in hot dripping until it is tender, then add the other ingredients. Mix them well. This quantity is sufficient for 2 rabbits or 1 fowl.

Fricassee of Rabbit

1lb. of boned rabbit
1 onion
1 sliced white turnip
1 or 2 sliced carrots
1 or 2 chopped stalks of celery
Bouquet garni: A sprig of thyme, parsley, a bay leaf, 1 clove, a strip of lemon, 4 peppercorns, a blade of mace—all tied in a muslin bag
Juice of half a lemon
Stock or water
Salt and pepper
Milk if required
2oz. of butter
2oz. of flour
1 egg yolk
3 tablespoons of cream or thick top milk

Cut the meat into pieces and place the pieces in a saucepan with the bouquet garni and the vegetables. Cover these ingredients with salted stock or water. Simmer the meat until it is tender (about 1½ hours), then strain off the stock. Make it up to a pint with milk. Make a white sauce by melting the butter in a saucepan and blending it with the flour. Cook the flour and butter paste for a minute, being careful not to let it brown. Remove the pot from the heat and add about ⅓ of the white stock. Mix the sauce to a smooth paste, return it to the heat, stirring it constantly, and add the remainder of the liquid. Season the mixture if necessary. Stir in the lemon juice and egg yolk, which has been beaten with the cream or top milk (unsweetened, evaporated milk could be used as a substitute). Reheat the sauce, but do not boil it. Pour it over the meat and vegetables and when they are hot serve the fricassee garnished with small grilled bacon rolls or sliced hard-boiled eggs and parsley or lemon slices. This quantity should serve four people.

Fried Rabbit

Wipe the rabbit and cut it into joints. These are lightly coated with seasoned flour and are fried in hot fat. The pieces are turned to allow both sides to be browned, 10 to 15 minutes being allowed for cooking. Serve the fried rabbit with brown gravy and thin, crisp potato chips.

Potato Chips

Wash and peel the potatoes. Slice them very thinly into rounds with a sharp knife or the wide slot of a kitchen grater. Place the freshly cut slices in cold water and soak them for about an hour. Dry them carefully on a clean cloth and then fry them in deep fat at 395 degrees F. until they are golden brown. At 395 degrees F. a small cube of stale bread will take 20 seconds to become a golden brown. A wire basket is very useful for holding the chips while they are frying. Drain the fried chips on clean, crumpled paper.

Rabbit Pie

Wipe the rabbit and cut it into pieces. The rib section has numerous small bones and for this reason it is often omitted from stews. Chop up some bacon or scraps of ham. Slice sufficient onion to line the bottom and sides of a greased casserole. Put in a layer of rabbit pieces and some bacon, and sprinkle pepper and salt over it. Put in another layer of onion slices, add the remainder of the rabbit and bacon, and cover it with a final layer of onions and pepper and salt. Pour in ½ cup of water or stock and cover the dish. Bake the mixture in a moderate oven for 2 to 2½ hours. When the meat is tender remove the casserole lid and replace it with a layer of pastry. Press a thin strip of pastry round the rim of the dish before placing the pastry top in position. Press the pastry top gently round the rim, avoiding stretching, and trim it with a sharp knife or kitchen scissors. Decorate the edge with a spoon or knife or fork. Twisted strips of pastry scraps may be used as decorations or leaves may be cut out and fixed in position with a little water brushed on their under sides. Bake the pie at 450 degrees F. (a hot oven) for 10 to 15 minutes.

Hare Recipes

Jugged Hare

1 hare
2 rashers of bacon
2 small onions
1½ pints of stock or water
1½oz. of flour blended with a little of the stock
Pepper and salt
4oz. of red wine
Bunch of herbs (thyme, sage, parsley, mint, and a bay leaf)
4 peppercorns
4 cloves
A little grated fresh lemon rind

Tie the herbs, peppercorns, and cloves in a piece of muslin. Wash the hare and cut it into joints. Save the blood. Flour the joints and fry these lightly in dripping with the chopped onion. Add the stock, herbs, and grated lemon. Simmer the jugged hare in a covered casserole in a slow oven for about 3 hours. Before serving the hare skim off any fat, remove the bag of herbs, and strain out the onion. Stir in the strained blood and the wine. A teaspoon of red currant jelly or other sharp jelly may be added. Reheat the casserole and serve the hare garnished with small forcemeat balls.

Forcemeat Balls

Liver, heart, and kidneys of a hare
A little stock or water
4oz. of breadcrumbs
1 tablespoon of chopped parsley
1 teaspoon of chopped onion
Pepper and salt
1 beaten egg or 2oz. of milk
Flour for coating
Dripping

Cook the liver, heart, and kidneys in the stock or water for a few minutes, then mince them. Add the dry ingredients and salt and pepper. Bind the mixture with the egg or milk and force it into small balls which are tossed in seasoned flour and lightly browned in hot fat. Drain the forcemeat balls on clean, crumpled paper. Serve them as a hot garnish.

Venison Recipes

Venison is the flesh of the deer, buck venison being considered better than doe venison. The fat should be a clear, creamy colour and the flesh dark red. The flavour is supposed to be much improved by hanging the meat for about 14 days, but the time the meat is hung will depend on the weather and on individual taste. The meat should be slightly "high", but not rotten. The haunch is considered the best cut of the carcass, but neck and shoulder joints are also satisfactory for roasting or frying. The breast requires longer, slower cooking.

Venison is fried or grilled in the same way as beef, but it needs a little more cooking fat, as it is leaner and drier.

Roast Venison

Use either the haunch, loin, neck, or fillet of venison for roasting. The meat should be soaked overnight in vinegar to which has been added a bay leaf, a few peppercorns, a sliced onion, and a glass of red wine. Dry the meat the following day and either lard it generously with dripping or coat it with a stiff flour and water dough about ½in. thick. Roast the meat in a slow oven (about 300 degrees F.), allowing 25 minutes per pound. Venison is a lean meat and requires plenty of cooking fat. Serve the venison while it is still very hot. A sharp jelly such as red currant, gooseberry, rowan, or raspberry may be served as an accompaniment.

Rowan Jelly

Rowan berries are the bright, red fruit of the mountain ash.

6lb. of rowan berries
1lb. of sugar to each pint of strained fruit juice
Sufficient water to cover the fruit
3lb. of tart apples

Pare and cut up the apples. Wash the berries, removing any stalks. Place the fruit in a saucepan and add sufficient water to cover it. Cook the fruit until it is soft and pulpy and strain it in a jelly bag. Do not squeeze the bag. Test the juice for pectin (see "Quickly Made Jams" in "Journal of Agriculture", January 1954, for the pectin test and a recipe for home-made citrus pectin extract). Add extra pectin if it is necessary. Boil the measured juice, add the sugar, and boil the syrup for 5 minutes. Pour it into clean, hot jelly jars. Cover the jelly with a thin film of paraffin wax.

South African Braised Venison

Cut up the meat as for a stew. Brown 1 or 2 chopped onions with a little finely chopped bacon and add the meat. Season the stew with salt and pepper, add 6 cloves, a little grated nutmeg, and a few blades of mace. Pour in a tablespoon of brown sugar. Cover the meat with water and braise it gently until it is tender (2 to 2½ hours). Thicken the gravy with a little flour about ½ hour before serving the meat. If necessary, add a little boiling water to the stew while it is cooking.

Venison Collops

Collops is the name given to small boneless pieces of meat.

Venison steaks are dipped first in lightly beaten egg and then in fine, hard breadcrumbs. They are fried in a pan with a little hot fat, 10 minutes being allowed for each side. Turn the meat once only.

Scotch Venison Collops

1lb. of minced venison
1 tablespoon of dripping or butter
1 finely chopped onion
1 cup of stock or water
Pinch of nutmeg
1 tablespoon of ketchup (tomato or mushroom)
½ small cup of breadcrumbs
Toast, cooked rice, grilled or baked tomatoes, or spaghetti

Mince the meat and some of its fat. Heat the dripping or butter in a saucepan and when it is very hot put in the onion and the meat. Stir these hard until the meat is browned, and then pour in the stock and add the seasonings. Add the ketchup and breadcrumbs, and cook the mixture for a few minutes. Border the individual servings with rice or spaghetti and garnish them with small squares of crisp toast and grilled tomatoes.

A Kid Recipe

Kid (a young goat) is usually dressed and cooked whole like sucking pig. The cleaned kid may be soaked for a few hours in a mixture of vinegar, cooking oil, and seasonings, and then hung for a day or two. The flesh is inclined to be dry, so it is advisable to baste it well with fat before roasting it. Flour the meat before putting it in the oven and roast it slowly for 1½ to 2 hours. Serve it with red currant jelly.

Wild Pork Recipes

The best pork comes from young, well-fed animals. The skin should be thin, the fat firm, and the flesh white. Pork should not be hung for more than a day or so, as it does not keep well, especially in hot weather. It may, however, be stored in a refrigerator. Because it is a fatty meat, very little extra cooking fat is required, and for this reason also it is advisable to cook pork very slowly. Pork should look white when thoroughly cooked, never pink.

Roast Wild Pork

Score the skin so that it will make crackling. Salt and pepper the meat and cook it in a moderate oven (325 degrees F. to 350 degrees F.). Allow 35 minutes for each pound and 30 minutes extra. To test if the meat is cooked run a skewer into the thickest part of the joint. Juice should not flow out when the skewer is withdrawn.

Serve the roast pork with apple sauce and thick gravy. A sage and onion stuffing may also accompany the roast pork.

Apple Sauce

It is usual to serve an unsweetened, tart apple sauce with rich, fatty meat such as pork or goose.

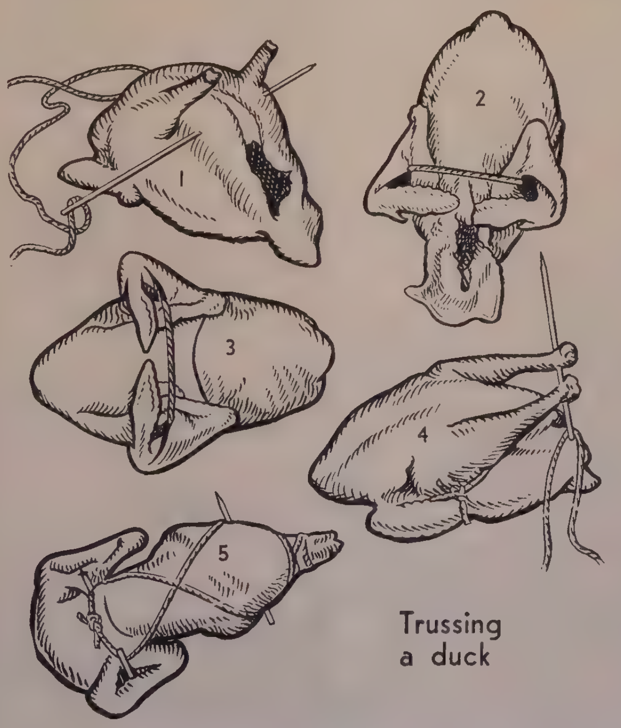
Peel and core some tart apples. Cut them into small slices and place them in a saucepan with a little water. Cook the apple rapidly, being careful not to burn it. When it is thoroughly cooked and well mashed (use a wooden spoon to break up the pieces if necessary) a small quantity of sugar may be added.

Roast Pork Loin

To make carving easier the ribs of the joint should be sawn through close to the backbone before it is roasted. Cook the loin in the same way as for roast wild pork.

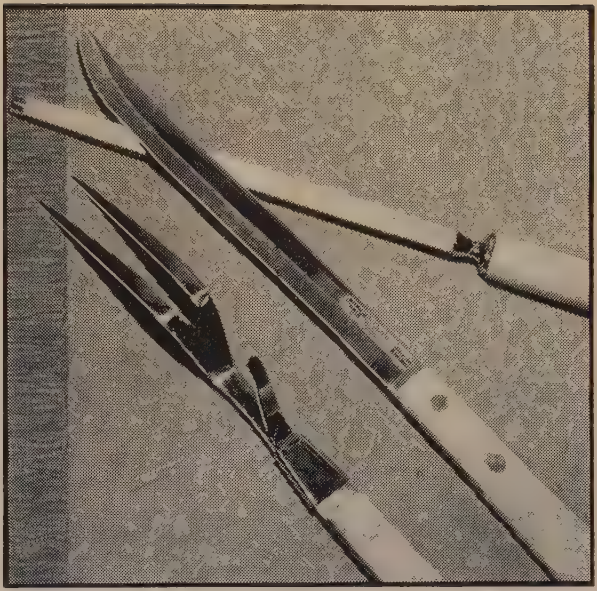
Grilled Pork Chops

Grill the chops in the usual way, allowing 25 minutes. Serve them with apple sauce and thick brown gravy.



Trussing a duck

1—Insert the trussing needle through the body below the second joint of the leg and pull the thread through. 2—Pull the thread through the wings and tie it tightly. 3—The neck opening may be stuffed and the skin tucked under the thread. 4—After the body cavity has been stuffed and the opening trussed with thread another strong thread is inserted through the legs near the joint. 5—Pull the thread from the legs around the tail and tie the legs close to the body.



A carving set for poultry. The knife blade is long and thin, tapering to a point.

Poultry Dishes

Grey, spoonbill, paradise, and mallard ducks, which are allowed to be hunted in the shooting season, are all cooked in the same fashion.

Roast Wild Duck

Young duckling does not require stuffing, though older birds may be stuffed with sage and onion. Alternatively, an onion may be placed inside the trussed duck. Wild duck flesh is inclined to be dry, so strips of fatty bacon are placed on the bird's breast while it is cooked. Roast the duck in a hot oven, basting it frequently, and allowing 15 minutes for each pound. Remove any skewers and threads from the bird when it is cooked and serve it with apple sauce, thin brown gravy, and orange salad. Green peas are often served with roast duck.

Thin Brown Gravy

Pour all the fat from the roasting tin. Stir in a little stock made from giblets or left-over bones. Add more stock, season it, and bring it to the boil. A little sugar browned on the drained pan (before the stock is added) will give a brown colour to the gravy.

Savoury Orange Salad

2 sweet oranges
Tarragon and chervil (if obtainable)
1 dessertspoon of vinegar
1 teaspoon of lemon juice
About 1 tablespoon of salad oil

Peel two oranges and remove all the pith. Slice the fruit thinly and place the slices in a salad bowl. Sprinkle them with a little chopped tarragon and chervil or, if these are not available, a little chopped mint may be used instead. Tarragon vinegar may be substituted for ordinary malt vinegar. Whisk the oil, vinegar, and lemon juice and drizzle it over the orange slices. Chill the salad before serving it garnished with sprigs of mustard and cress or mint.

Braised Wild Duck

The trussed birds, which may be stuffed, are placed in a casserole with a little dripping. Strips of fat bacon are laid on the ducks and the lid is placed on the casserole. Cook the birds in a moderately hot oven for an hour and then baste them. Continue the cooking for another ½ hour without the lid on the dish. Serve the ducks with a rich gravy flavoured with red currant jelly or port wine. Watercress and lemon slices may be used as a garnish. Orange salad is usually served with braised duck.

“Bambino”

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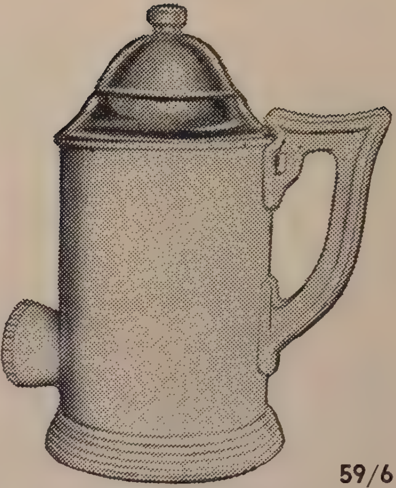

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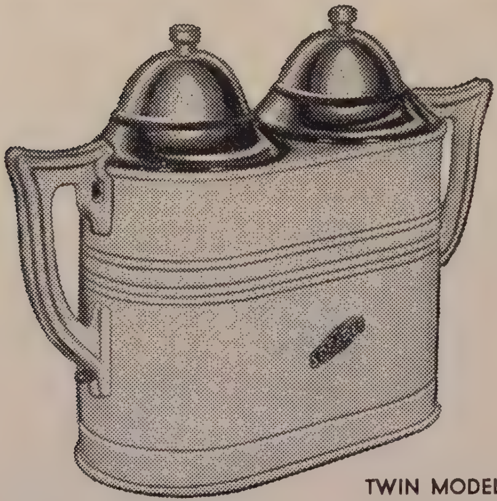

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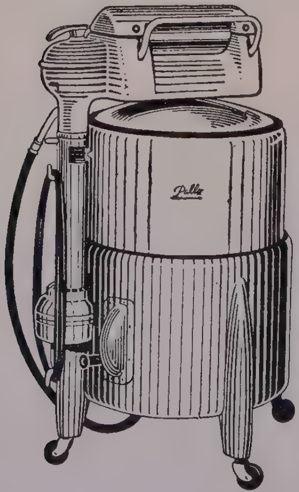

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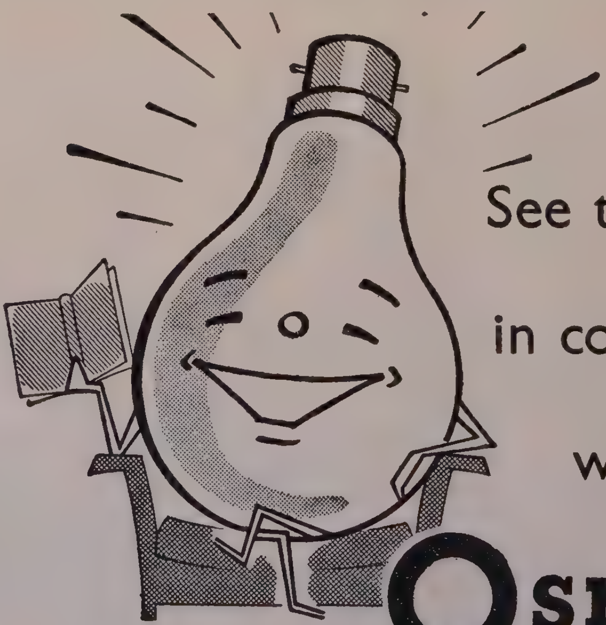

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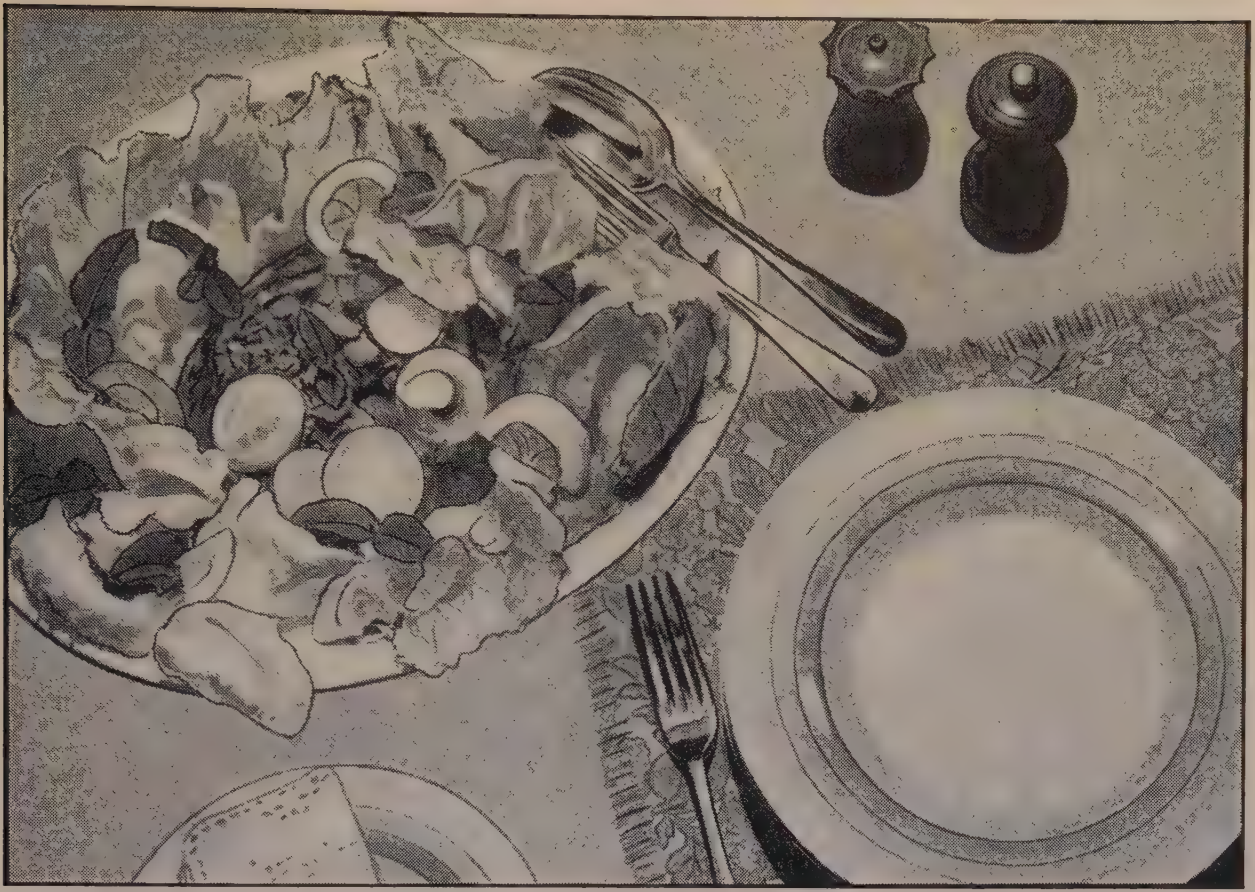


Game aspic is an appetising dish and offers an attractive way of using up cold game.

Roast Quail

Pluck and singe the birds. Remove the heads, necks, and crops, but leave the trail. Cut off the wings at the first joint and pick out the shot. Truss the birds for roasting.

Brush the trussed birds with warmed fat and wrap each one in a vine leaf and a rasher of bacon. Roast them in a hot oven (450 degrees F.) for 15 to 20 minutes. Remove the trussing string, the vine leaves, and the bacon, and place the birds on pieces of toast. Garnish them with the cooked bacon rashers and watercress. Serve a rich, brown gravy with the birds. It is usual to allow one bird for each person.

Pheasant

Cock pheasants only are allowed to be shot. It is usual to hang the bird for a few days after it has been shot, but the time will vary according to individual taste.

Pluck and singe the bird, keeping the best of the tail feathers. Cut off the head and neck and remove the crop. Remove the inside and wipe the bird with a damp cloth. Scald and skin the feet. Do not stuff the pheasant, but instead place inside it a knob of butter seasoned with pepper and salt and a squeeze of lemon juice. Truss the bird by pushing the thighs hard back under the wings and skewering them into position. Tie the legs firmly together so that the feet stand up. Remove the tips of the claws and sew up the neck skin. Place 2 or 3 rashers of bacon over the bird and roast it in a hot oven (425 degrees F.) for ½ to 1 hour. Baste it frequently. Serve the roasted pheasant with its tail feathers fixed into position and accompanied by crisp, browned crumbs and rich, brown gravy. A green salad is usually served with roast pheasant.

Swan

Swans may present a cooking problem to those unfamiliar with them, but a young swan, when properly prepared, can be delicious. White swans, which in England are known as Royal birds, are protected in this country, so that only wild, black Australian swans are allowed to be hunted in the shooting season. The beak of a young swan should snap easily when pressed between the fingers, whereas that of an older bird is tough and leathery. Use only young birds for roasting. As soon as possible after shooting it skin the swan and clean it. Hang it for a day or so if a pronounced flavour is desired, but the flesh of a swan is naturally rather strong and hanging will intensify this flavour. Parboil the bird for 2 hours and allow it to cool in the cooking water. Drain it and stuff it with onion stuffing. Place the trussed bird in a roasting pan and cook it in a slow oven (300 degrees F.), allowing 25 minutes for each pound. Baste the bird frequently. Serve roast swan with a sharp jelly such as red currant or gooseberry.

Game Aspic

1oz. of gelatine
½ stick of celery
1 small onion
1 small carrot
Small pieces of cooked game
½ pint of water
2 tablespoons of vinegar
½ teaspoon of salt
Pepper to taste

Dissolve the gelatine in a little cold water. Dice the vegetables and cook them. Re-dissolve the gelatine in ½ pint of boiling water and add the vinegar. Put the vegetables and game in a bowl and pour the liquid gelatine over them. Season the mixture with salt and pepper. When the aspic is just beginning to set pour it into a mould. Serve the aspic with lettuce leaves or with a salad.

It is important to remember that seasonings are less obvious to the palate in cold mixtures than they are in hot ones, and therefore the aspic should be tasted as it is being poured into the mould. Monosodium glutamate, a salt which is extensively used overseas to bring up the flavour of meats, soups, and aspics, is now available in New Zealand.

Winter-flowering Shrubs for Flower Garden

FLOWERS are appreciated possibly more during winter than at any other season of the year, yet winter production of flowers can present a problem in many gardens. There are, however, many shrubs which are at their best during this season and by including one or more winter-flowering shrubs in a planting scheme it is possible to create a show of flowers even in winter. This article by M. J. Lockie, Horticultural Instructor, Department of Agriculture, Auckland, deals with the culture of a number of winter-flowering shrubs. The section on flower garden work for May is by S. P. Money, Horticultural Inspector, Department of Agriculture, Wellington.

WHEN leaves have fallen and perennials are trimmed to a few inches above ground the garden is inclined to look bare and empty. And though a certain amount of colour and interest is maintained by berried shrubs and the colourful bark of some deciduous trees, it cannot overcome the absence of flowers.

The most useful shrubs are those which not only flower during winter, but whose flowers last well on the bush and remain relatively unharmed by rough weather. The time of flowering of these shrubs may vary by a few weeks, depending on severity of winter conditions in the district.

Hardy Shrubs

Hardy shrubs described here do not require protection from frost and can be expected to grow well under average garden conditions.

Winter sweet (*Chimonanthus praecox*), a native of China, bears scented, wax-coloured flowers along its bare stems, sometimes before all the old leaves have been shed. Rather slow growing during the early stages, it eventually forms a large, dense shrub 8ft. to 12ft. high, and as long as the roots do not dry out unduly during summer it appears to do well in open or partially shaded situations. Flowers are produced on spurs and on old wood, so that little pruning is necessary beyond occasionally thinning the centre of the bush to allow more light to penetrate. This pruning can readily be attended to when branches are being picked for use in decorative work. The flowers, though not showy, are dainty and stand up well to the weather and are produced freely over a long period.

The japonicas (*Chaenomeles lagenaria* (*Cydonia lagenaria*)) are a group of easily grown, bright flowering shrubs from China. There are many varieties ranging through dark red, orange, and pink to white. Winter Cheer, with orange-scarlet flowers, is perhaps the first to flower, followed by Falconette Charlotte, with double pink flowers, and Alba, the white variety.

Japonicas grow rapidly to form large bushes up to 8ft. high and spread out to an equal diameter. Flowers are produced on mature wood, so that it is usual for flowers to be produced only on the lower part of the bush during the first 2 to 3 years, but thereafter the amount of flowers rapidly increases until a fully grown bush is completely covered. The only pruning required is the shortening of long growths to keep the bush in bounds.

Japonicas can be used as a trimmed hedge, and they are most attractive while the flowers show through the bare brown stems, but during the remainder of the year the hedge looks a bit sparse. The yellow Japonica "apples", more interesting than ornamental, can be used to make jelly.

Many of the ericas (heaths or heathers) flower prolifically throughout winter and even the smallest bush flowers the first year of planting. Among the varieties there is a wide difference in flower shape and colour. *Erica melanthera*, probably the most widely known variety, has clusters of small mauve flowers; *E. cruenta* has long spikes of scarlet, tubular flowers; Winter Gem has small, bell-shaped, orange-scarlet flowers, and *E. darleyensis* has long, tubular, rosy pink flowers. All these varieties grow to about 4ft. and there are many other varieties that are equally effective for a long, colourful display. Varieties of *E. carnea* will withstand severe winter frosts and are dwarfer than those listed.

Left—*Erica cruenta*. Right—*Cydonia lagenaria*. [*Douglas Elliott*

[Douglas Elliott

Left—*Thryptomene mitchelliana.* Right—*Acacia baileyana.*

Ericas are surface-rooting shrubs and require a cool, moist root run. Mulching with lawn clippings or compost helps to shade and protect the roots from drying out in summer and because they prefer slightly acid soil conditions, lime should never be applied where they are growing.

Pruning should be carried out after flowering to encourage the development of a free-branching, compact shrub. In varieties such as *E. cruenta,* which has a long flowering spike, the top of each shoot is cut back to just below the position of the lowest flowers. In varieties such as *E. melanthera,* which flower on a very small amount of new growth, clipping off the spent flowers with scissors is sufficient. Ericas should not be pruned so hard that cuts are made into old wood, as new growth will not break from the old.

Forsythias, of which *F. intermedia spectabilis* is among the showiest, grow to a height of 5ft. and produce masses of bright yellow, bell-shaped flowers along bare stems during late winter. These shrubs are outstanding when in flower, and in autumn their foliage turns dark bronzy purple.

Chinese witch hazel (*Hamamelis mollis*) is attractive throughout the year and grows to a height of 6ft. During winter the strongly scented flowers, made up of twisted, yellow, thread-like petals, are clustered along the bare, brown stems. These are followed in spring by large, grey, hairy-ribbed leaves which are effective in themselves. Witch hazel requires a sunny situation where the roots do not dry out in summer.

Yellow-flowered jasmine (*Jasminum nudiflorum*), a native of China, can be grown as a shrub which reaches 6 to 8ft. with age, or kept as a trimmed hedge; although not a climber, it can also be trained along wires or a fence. The bright green foliage and green stems look neat whichever way the plant is treated, and the yellow flowers show up well against them. Similar, but less hardy, is *Jasminum primulinum,* which bears double yellow flowers. Pruning to maintain the shape desired is all that is required.

Corylopsis spicata from Japan grows to a height of 4ft. and flowers well in late winter, producing delicate yellow flowers. In autumn the leaves also turn yellow and provide a second display of colour.

Viburnum fragrans, height 5ft., is a fine winter flowering shrub for the colder areas, as it is very hardy and produces sweet-smelling pink and white flowers on the tips of the leafless shoots. In these areas *Daphne mezereum,* a dwarf shrub of about 4ft. with both pink and white varieties, grows well. A shady site is preferable and the flowers are followed by berries, which provide the gardener with a ready means of increase.

Berberis japonica and var. *bealei* both produce fragrant tassels of yellow flowers in early spring and grow to a height of 6ft.; they are very suitable for planting under ornamental trees in the colder parts.

Frost-tender Subjects

Shrubs which are frost tender must be grown in frost-free areas or protected from frost if their full beauty is to be enjoyed.

Heliotrope or cherry pie (*Heliotropium arborescens*), is a sweetly scented, semi-climbing shrub from Peru. An ideal situation for it is against a sunny house wall, especially where protection from frost is required. In warmer, frost-free gardens it does well in an open border, where it sprawls and covers quite an area, producing clusters of mauve flowers on every branch. Easily increased by cuttings, it can be made into a standard, when the long stem requires secure staking, or it can be grown as a pot plant.

Luculia gratissima, native to the temperate Himalayan region, is grown extensively for its large clusters of pink, scented flowers. It requires a sunny, well-drained situation in a rich soil. The tree has a spreading habit and grows from 6 to 8ft. in height, and there is a wide seedling variation in intensity of flower colour and earliness of flowering. Pruning to maintain a well-shaped shrub is all that is necessary and may be carried out when flowers are being cut.

Lasiandra (*Tibouchina semidecandra*), a native of Brazil, forms a wide, branching shrub of 8ft. to 12ft. high. During its early years it is more likely to be damaged by frost, and at all times strong winds cause scorching of the foliage. If its fullest beauty is to be enjoyed, it should be grown in a sheltered situation where its roots will not dry out in summer. Pruning should be carried out after flowering to maintain a compact bush. The velvety, purple flowers are short lived, but there is always an ample supply of buds coming on to maintain a continuous display of flowers. The variety *Tibouchina semidecandra grandiflora* makes an even more colourful display, with its larger flowers of 4in. to 5in. diameter.

Shrubs and Trees for Drier Situations

This group of shrubs and trees tolerate hard, dry conditions and do well in average to poor garden soils.

Many of the wattles (acacias) make extremely graceful trees and as they

Camellia sasanqua hiryu. [Douglas Elliott

grow quickly, they are most useful where summer shade or a quick screen is required. Cootamundra wattle (*Acacia baileyana*) grows to a height of 15ft. and is the variety most commonly grown as an ornamental tree. There is quite a seedling variation among them, some being earlier to flower and some having brighter yellow flowers. Two of the best acacias for garden use are *A. pravissima*, an upright tree of 15ft., flowering on long, pendulous branches, and *A. podalyriaefolia*, a handsome, early flowering shrub of 8ft.

Acacias may be difficult to transplant and care should be taken not to damage the roots. Little pruning is necessary beyond shortening back extra vigorous growth to maintain a well-shaped tree.

Banksias are evergreen Australian shrubs with large flowers which show up well in the distance. Because of this they are most useful for planting on dry or rocky banks and in coastal areas; they are not suitable for very cold districts. Varieties commonly grown are *Banksia ericifolia*, height 8ft., flowers amber; *B. ericoides*, height 5ft., reddish cones; and *B. grandis*, height 15ft., cones greenish yellow with distinct foliage, making it effective at all seasons.

The large flower cones are produced during winter and persist a long time on the shrubs, providing a welcome source of food for birds during winter. The flowers last well when cut and the seed formation is interesting both for decorative work and on the bush. Planted on banks with ample room to develop, banksias require little care, but in smaller gardens or border plantings they should be planted toward the back of the border where other lower growing shrubs can hide the sparseness of their bases.

To prevent an open base from developing banksias should be pruned every year after flowering by reducing the current season's growth by half, **but do not cut into old wood,** as new growth comes only from young wood. Where the banksia is in an exposed position this pruning is essential to develop a compact bush that is less likely to be damaged by wind. Quick-growing shrubs, they soon become top heavy, and if this occurs there is every chance of their being blown over.

The buttercup tree (*Cassia corymbosa*) is a brilliant yellow flowered tree from South America which flowers in May and June and retains its bright green foliage throughout the year. It is quick growing and reaches a height of 10ft. with rather an open, spreading head. As it is surface rooting, during heavy wind it is inclined to work loose in the soil, so that it should be firmly tied to a stout stake.

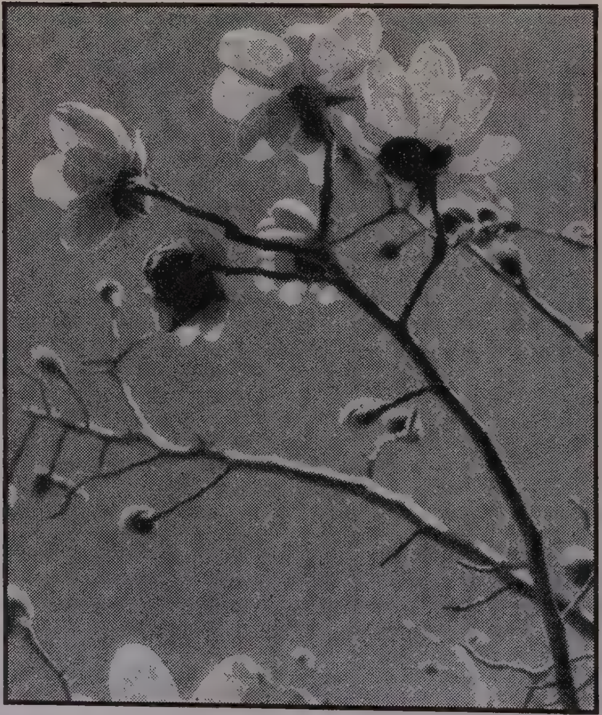
Proteas are grown extensively for the beauty of their long-lasting flowers, which remain unspoilt by adverse weather conditions. There are many good varieties, a few of which are: *P. neriifolia*, long, pink flowers tipped with brown fur; *P. susanniae*, large, open, deep pink flowers; and *P. scolymocephala*, which has much smaller and daintier cream flowers and is most useful in decorative work. Proteas range in height from 3ft. to 8ft. and form spreading bushes.

They require a free draining situation and do well in average to poor, dry garden soil. Being quick-growing shrubs, they soon develop a sparse base and heavy top unless careful attention is paid to pruning during the early years.

As soon as a young protea is planted, and after flowering each year, the new growth should be reduced by half its length.

Do not cut into old wood, as new growth will not shoot from it and an ugly, bare stump remains.

As with the banksias, pruning is essential to develop a compact shrub that is less likely to be damaged by wind. Once a protea has developed an open, sparse base it is too late to



Magnolia campbelli. [Douglas Elliott

do anything about it beyond planting a low-growing shrub in front to hide it.

Low-growing Shrubs

The following low-growing shrubs are suitable for planting in the front of a border or in the small beds near the base of the house or by the front door.

Adenandra fragrans and *A. uniflora* are two prolifically flowering shrubs from South Africa which grow to a height of 3ft. *A. fragrans* has bright pink flowers and *A. uniflora* has slightly larger white flowers. Both shrubs maintain a neat, round shape and throw all their flowers on the outside of the bush, making the most of every bloom.

Protection from heavy frost is necessary, and given a position with good drainage and full sun, they are effective through a long winter season. Pruning is not necessary and the flowers of both shrubs can be used for decorative work.

Bouvardias, low-growing shrubs from Mexico and Central America, produce clusters of bright, tubular flowers ranging through reds and pink to white. To flower best they require a warm sunny situation sheltered from frost with an ample supply of moisture during summer. After flowering, spent wood should be cut hard back. New shoots develop early in the year ready to produce flowers the following winter. Bouvardias are excellent as a cut flower.

Daphne in its white and pink varieties (*Daphne odora* and *D. odora rubra*) is probably the most widely known and grown winter flowering shrub. It will grow under a wide range of conditions, though it prefers a cool, moist root run and shade during some part of the day. The two extremes of hard dry soil in summer and wetness in winter should be avoided. Unfortunately, daphnes are subject to a virus disease which causes the bush to look yellow and unthrifty. Though there is no cure for this disease, improvement in the condition of the plants can generally be effected by applying sulphate of ammonia at 1oz. per square yard or a mulch of farmyard manure.

Thryptomene mitchelliana is a stiff, heath-like shrub of 4ft. from Australia. It does well in a sunny situation in average garden soil. During August it is covered with masses of dainty white flowers which show up well in the garden and are most useful for decorative work.

Larger Shrubs and Trees

Larger shrubs and trees are given in this section.

Camellias are prominent among winter-flowering shrubs for producing a colourful display, and though rough weather may bruise the flowers, it is usually possible to find a few perfect blooms when required for decorative work. Fallen flowers are messy, particularly if they fall on paths or lawns, but where the camellias are planted in a bed this nuisance is not nearly so apparent.

Some of the older varieties of *Camellia japonica*, such as Countess of Derby, make useful shelter trees, as they form a dense, evergreen hedge of even height and depth.

Flowering even earlier than the *C. japonica* varieties are *C. sasanqua* varieties, of which *hiryu* is the best known. Flowering through April, May, and June, *C. sasanqua* and vars. have a much daintier habit of growth than *C. japonica*, with small leaves on slender stems, and they grow only to a height of 6ft. *Hiryu* is a prolific flowerer; its bright pink flowers look well on the bush and are excellent for decorative work.

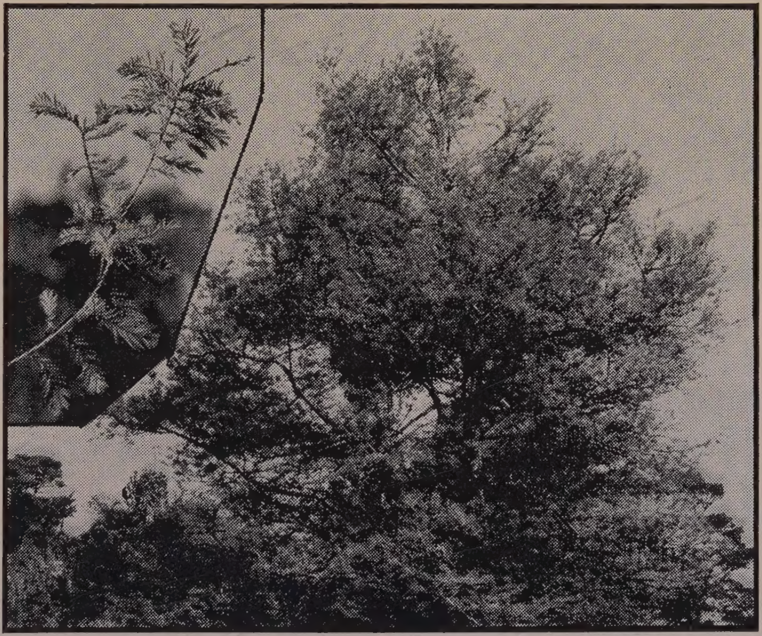
Australian rose apple (*Eugenia myrtifolia* syn. *E. paniculata* var. *australis*), is a quick-growing tree of 15ft. While young it is frost tender, but once established it will stand light frost.

The large, bright, rose-purple fruit are produced freely in winter on older wood and are ornamental on the tree and for decorative work.

Magnolia stellata, native of China, grows to a height of 4ft. to 6ft., though very old plants may reach 12ft. A slow-growing, free-branching shrub, it forms a good round head and requires little pruning to keep it to shape. The narrow-petalled flowers open wide and have a light fragrance. Frost and wind sometimes cause browning of the rather soft and delicate flowers, but other buds keep unfolding to display perfect blooms. The shrub will flower even the first year of planting out, but it has a better chance of establishment if all buds are kept off the first year to allow the shrub to build up a stronger branch system. The variety *M. stellata rosea* has petals tinged with pink.

A magnolia with really pink flowers is *M. campbelli*, native of the Himalayan region. The tree has an excellent natural shape and when the large,

Swamp Cypress or Bald Cypress

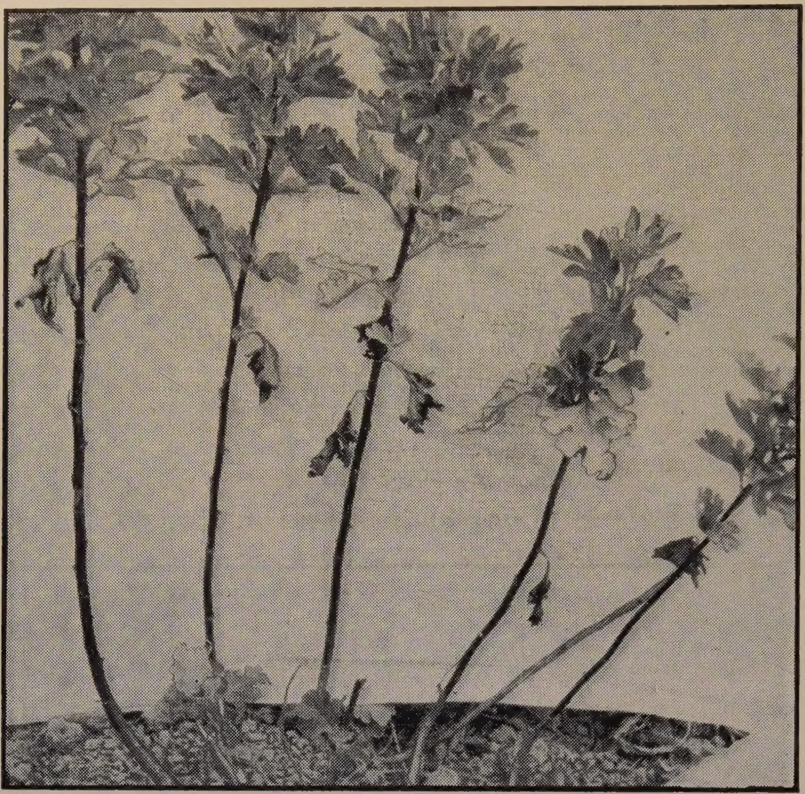


THE swamp cypress or bald cypress (*Taxodium distichum*) is a beautiful tree from the swamps of the Florida Everglades and other parts of south-eastern U.S.A. The deciduous, feathery, yew-like foliage of this tree becomes a rich red-brown in autumn. In winter the small twigs are shed along with the foliage, which allows light to reach the ground beneath the tree freely, so that grass may be grown right up to the trunk, making it an ideal lawn specimen tree, especially as it has a highly ornamental conical shape. The fallen foliage being small is seldom a nuisance. In spring the new feathery foliage is a most attractive pale green.

The bald cypress takes several centuries to reach maturity, eventually attaining a height of more than a 100ft. in the U.S.A. In the garden, however, it remains a small tree of pleasing dimensions for a very long period. This tree is ideal for planting in a damp spot or along a stream bank, as it does not suffer from wet feet; it will also grow in a well-drained position if sheltered. It prefers an acid soil, and is hardy in most parts of New Zealand.

The best plants are raised from seed sown in spring. If the seed is not quite fresh, it should be soaked in warm water before being sown. Cuttings may be struck in very wet conditions under glass.

—*F. E. WILKIN, Horticultural Inspector,*
Department of Agriculture, Wellington



[*Photo News*

Chrysanthemum plant which has been attacked by eelworm, causing withering and loss of lower leaves.

water lily-like flowers are shown up against bare, silvery brown branches it makes a magnificent sight.

Layered plants flower in 7 to 9 years, but seedling plants may take 25 years or longer to come to flower. Not very hardy, *M. campbelli* should be planted where it will receive some protection from heavy frost and strong wind. The flowers are produced when the weather is usually unfavourable, and buffeting by strong wind damages them considerably.

Magnolias are frequently difficult to transplant and establish; better results may be gained by transplanting them just as growth is starting.

Rhododendron Sir Robert Peel is the earliest rhododendron to flower and is a wonderful standby in the garden. It grows to a height of 30ft. with a round, bushy head on a single trunk, and carries large bunches of bright pink flowers during winter. This rhododendron is not as particular about soil conditions as many others, though it prefers a cool, moist root run. A neat tree, it can be used in small gardens as a shade tree.

R. delavayi is not grown nearly as much, but it is also an early flowering variety, and forms with age a rather small, open-branched, gnarled tree which produces clusters of clear, scarlet flowers. Numerous other varieties of rhododendron continue the display of flowers throughout the spring.

The evergreen azaleas (*R. indicum* (*Azalea indica*)) grow well in partially shaded positions in sheltered or frost-free gardens. A wealth of flowers are produced and range from white through varying shades of pinks, brick red to red, and magenta. These azaleas are useful, as they give a prolonged display and will flower under conditions of heavier shade than most plants appreciate.

Garden Work for May

May heralds a period of bareness in most gardens, but there are still many jobs to be done.

Annuals

Sow outside for early summer flowering such hardy annuals as sweet pea, larkspur, godetia, clarkia, nigella, and cornflower.

These annuals are better sown in the position where they are to flower. Care should be taken not to sow the seeds too thickly, as this will entail needless thinning out. Self-sown seedlings from plants grown earlier in the year can be carefully lifted and transplanted to more suitable or convenient situations.

Thinning of annuals sown earlier in the year should now be done.

Deep digging is a feature in preparing the beds for sweet peas, but subsoil should not be brought to the surface. After deep digging, composted leaf-mould should be added and mixed into the bed a week or two before planting.

Gladiolus corms which have been lifted and dried off should now be ready for cleaning. This is not essential, but while it is being done the corms can be examined for disease. Corms showing bad scars or rotting should be burnt, as they are capable of carrying over serious diseases. The corms should be dusted with D.D.T. dust to control the adults of gladioli thrips, which overwinter on the corm beneath the scale leaves.

Dahlia tubers should be lifted as they go out of flower, though some gardeners, especially in mild districts where no heavy frosts are experienced, prefer to leave them. To protect them from frosts in a district where the ground becomes very cold or frozen they are best dried off thoroughly and stored in a dry, frost-proof place. Temperatures of 35 degrees to 40 degrees F. are sufficient to keep the tubers in good condition. The tubers can be kept plump and firm by storing them in boxes of dry sawdust or cavings from grain threshing.

Cuttings to be taken now are those tender and half-hardy bedding plants which are likely to be severely injured or killed by frost or cold winds. Fibrous-rooted begonias and heliotrope are examples.

Young and vigorous shoots should be chosen and placed in sandy compost in a closed frame protected from the frost by scrim.

It is still not too late, especially in the warmer districts, to put in cuttings of carnations.

Layered shoots of shrubs and perennials can now be severed from the parent plants if sufficient roots have developed. Transplanting to prepared beds can be done during May or June.

Chrysanthemums: Now is the time to take measures against those plants which showed symptoms of eelworm during the growing season, notably those which showed browning and loss of lower leaves, the result being a tufted appearance at the top of the shoot and patches of bare stem. Old flowering shoots should be cut off and burnt and dead leaves around the plant collected and burnt. The clumps should be left where they are growing and when new shoots appear these should be sprayed with nicotine sulphate, **1 teaspoon to 1 gallon,** twice before stools are split and again after the plants are lifted and set out.

All vacant ground should be dug deeply and left rough to ensure that the lower layers of soil are broken up to allow easy penetration of the root systems later.

Care should be taken while digging to remove roots of sorrel, twitch (couch grass), and tap-rooted weeds like dock. These should not go to the compost heap but to the rubbish fire.

This is a good time to apply a surface dressing of lime (2oz. to the square yard).

Garden tools should be looked at now, scythes and sickles should be sharpened and oiled, rust should be rubbed from tools not being used at present, and oil applied to the surfaces. Lawnmowers and shears can now be sent for sharpening and setting. There are many advantages in starting the new season with bright, sharp garden tools. Tools in good condition make the work easier and more enjoyable.

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Here's another way to prune WASTE from your orchard

 WESTINGHOUSE-RECOLD cool store ill cut waste out of your orchard for ever! ick and stack . . pick and stack . . . that's all ou need to do! Stack your fruit high to the eiling of your Westinghouse-Recold cool store nd shut the door! Apples, pears, plums, eaches and small fruit keep dewy-fresh at con-olled cool temperatures. No waste; no rotting; o transport worries. And because you sell on e best markets you get bigger fruit cheques. on't waste another day. Get the facts and art SAVING fruit and MAKING MORE ONEY!

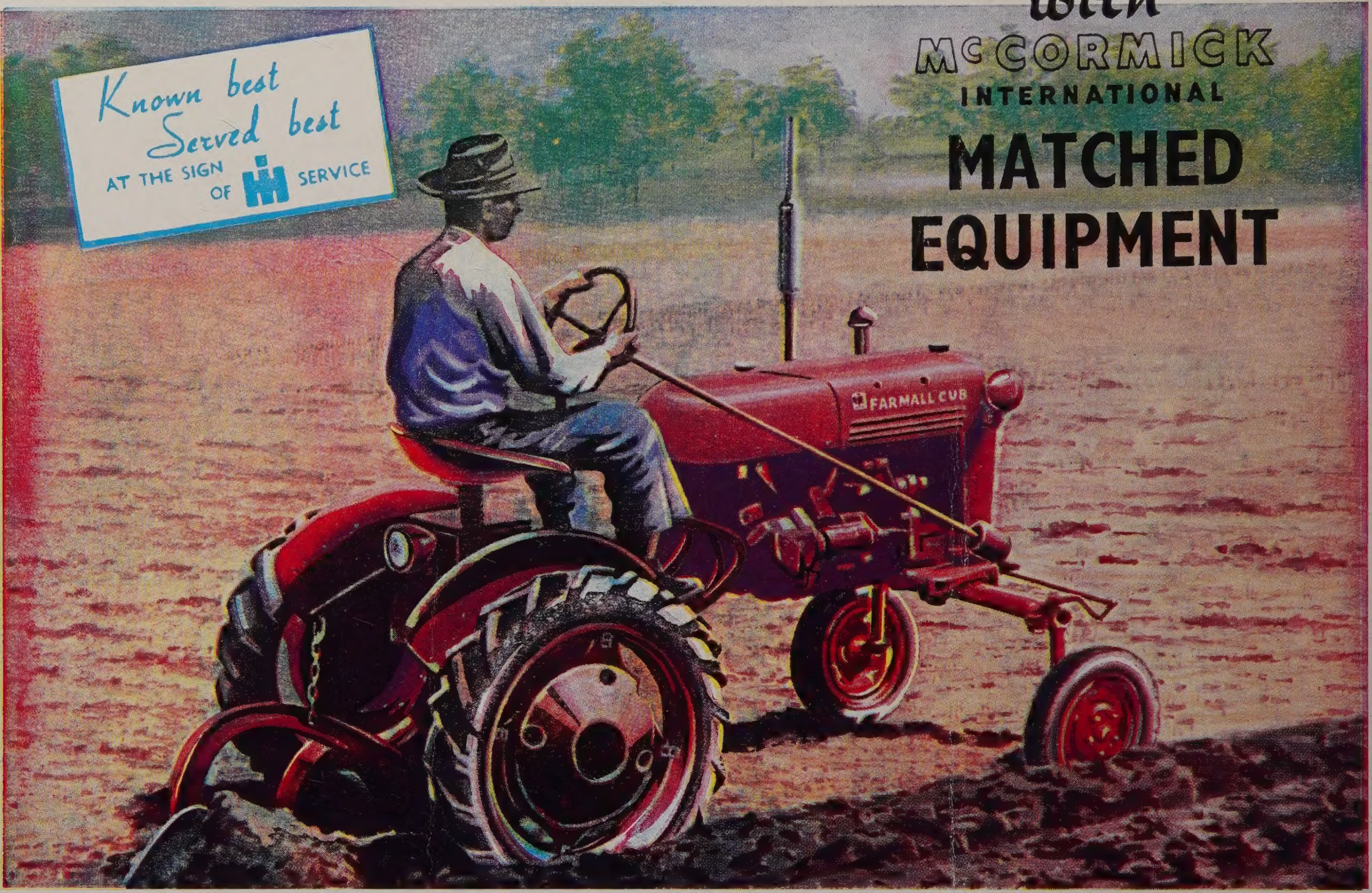
FREE! Write to your nearest Westinghouse—Recold branch! (See below.) Ask for an 'on-the-orchard' inspection and quotation for providing a cool store to suit your needs exactly. Existing wood or concrete sheds can be converted. No obligation.

Invest in a LOW COST

WESTINGHOUSE RECOLD Cool Store

Write to: H. W. Clarke (N.Z.) Ltd., 42-46 Cable Street, Wellington. Teed Street, Newmarket, Auckland. 256 Cashel Street, Christchurch. 1 Cliff Street, Timaru. 84 Tainui Street, Greymouth. 28a Bridge Street, Nelson. 78 Fitzherbert Ave., Palmerston North. 399 Moray Place, Dunedin.

TO PLOUGH AND SOW AND REAP AND MOW



and to be a FARMALL CUB owner

—means that you can do all the jobs on the Farm—twice as well when you have the CUB to help you. The 4-cylinder engine is very light on fuel, yet you have 8.89 h.p. at the drawbar or 9.76 h.p. on the belt. The famous Hydraulic Touch Control gives effortless operating of equipment, and "Cub culti-vision" gives full view ahead, around, and beneath the tractor.
With its full line of matched equipment the Farmall Cub is the ideal tractor, doing all of the work on the small farm and the lighter jobs on the big farm.

See your nearest IH Dealer for full facts

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